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GAS JOURNAL
Established 185[illegible] Pioneer of the Gas Industry
Including · GAS INDUSTRY · Est. 1900 ·

The First
Cast Iron Meters
used in
BUTANE GAS
were
SPRAGUE METERS
These Meters are giving
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Sprague Meters and Regulators
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The New England Fuel and Transportation Company has contracted with the Koppers Construction Company for the design and construction of 148 Becker Type Combination Coke and Gas Ovens at Everett, Massachusetts.

Auxiliaries include Koppers Gas Producers for oven heating, material handling and by-product recovery plants. The ovens will have an annual carbonizing capacity of over 1,150,000 tons of coal.

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GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
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Executive and Editorial Offices, 53 Park Place, New York City

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H. M. RILEY, *Editor*

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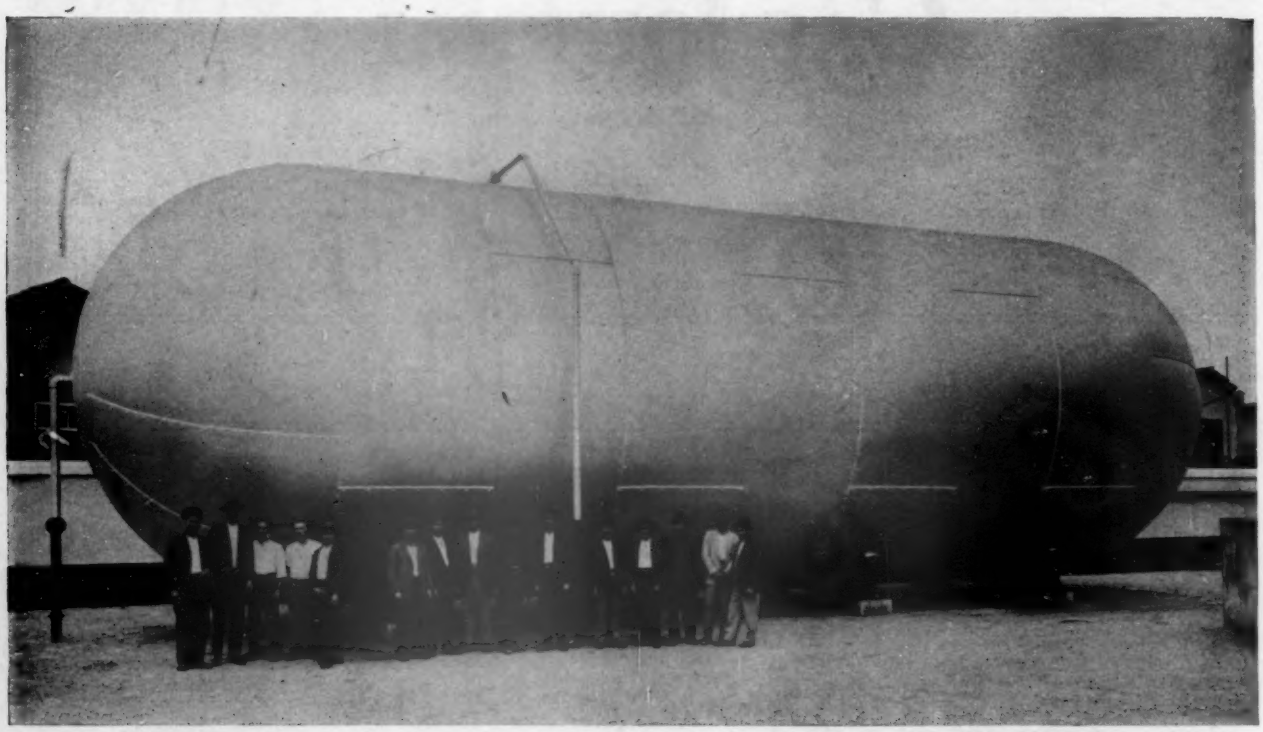

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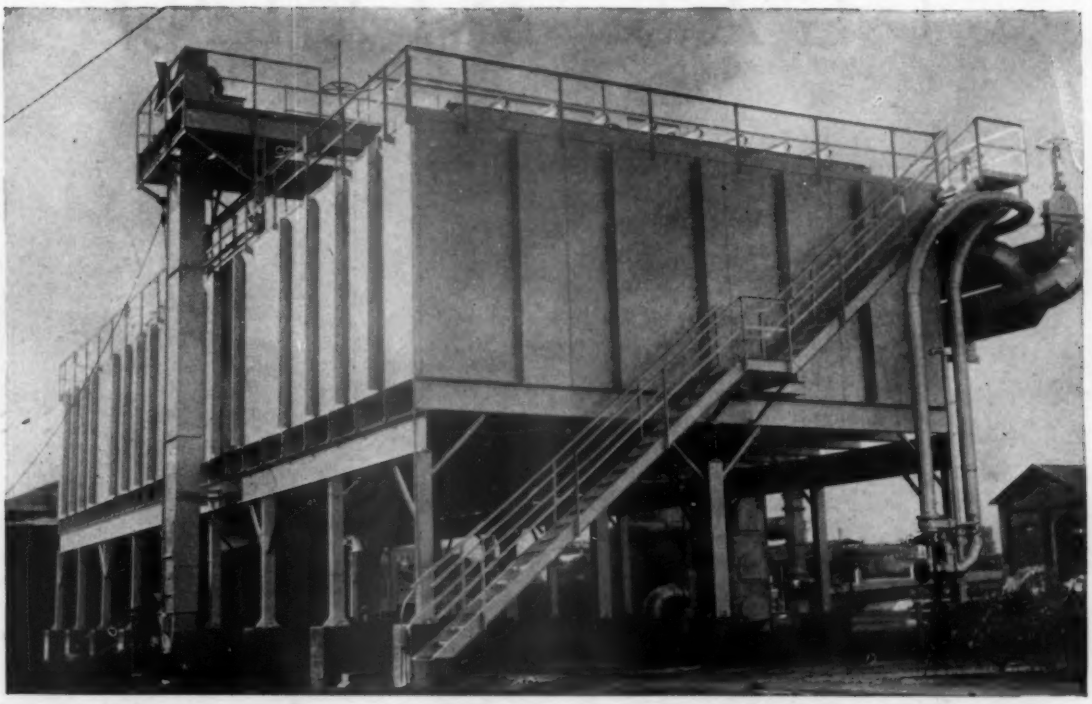
PURIFIERS



THIS four-compartment purifier was built by the SEMET-SOLVAY ENGINEERING CORPORATION at Havana for the Campania Cubana de Electricidad. Material was shipped direct and fabricated by electric arc welding on the site, resulting in important saving to the customer.

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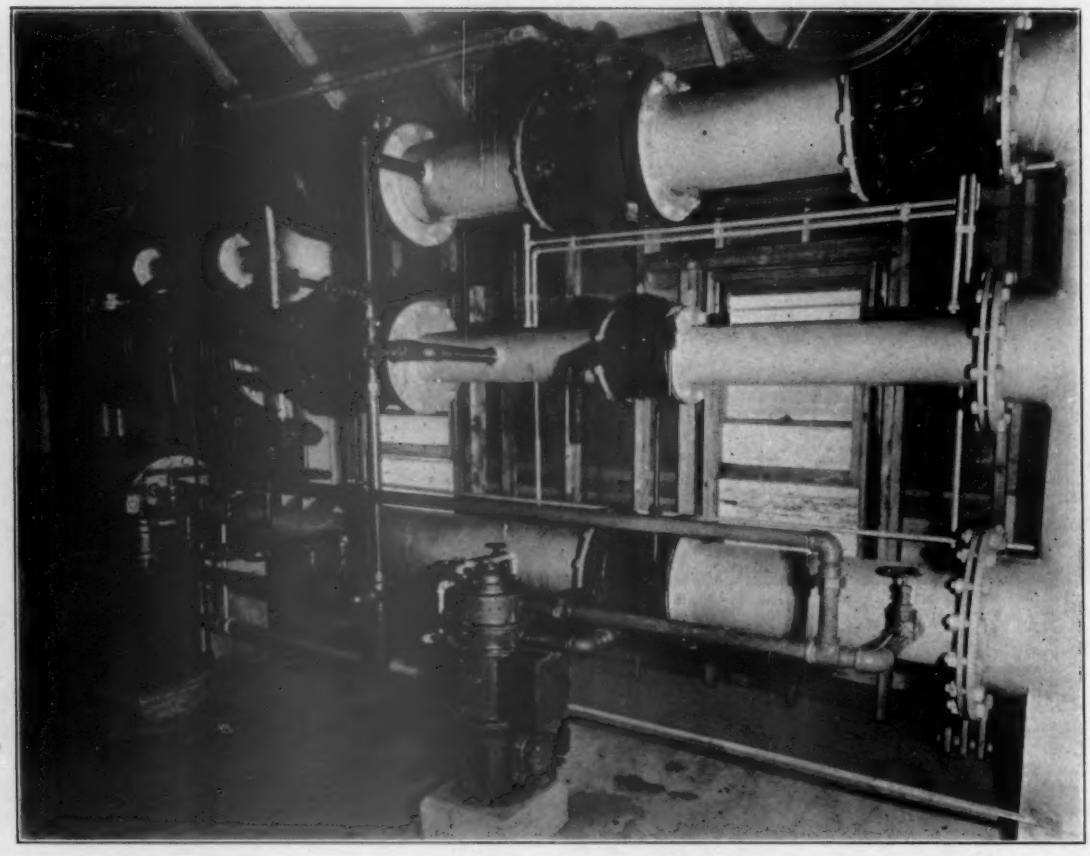
SMOOT CONTROL of GAS MIXING



Smoot Gas Mixing Control at the Union Natural Gas Co.—Windsor, Canada

The Smoot Gas Mixer is a Mechanical Volumetric Control with Regulators which vary the flows of the constituent gases by maintaining the pressures and volumes of the gases in proper proportions.

It is accurate, quick and stable and responds instantly throughout a very wide range to all variations in the quantities of gases entering or leaving the mixer.

If desirable, an auxiliary corrector operating in conjunction with a B. T. U. Analyzer may be furnished to maintain constant the quality or B. T. U. of the mixed gas delivered.

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U.G.I. Research Contributions to the Gas Industry

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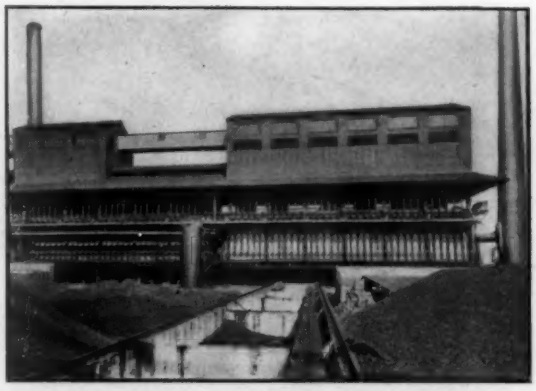
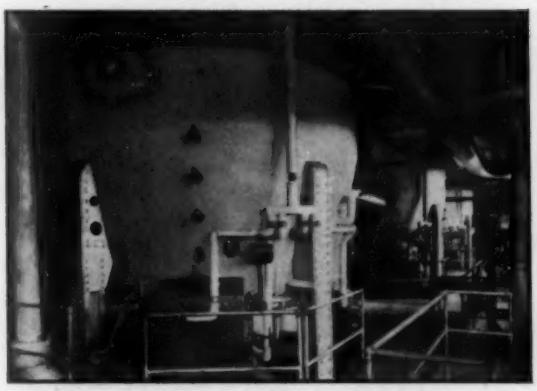


U. G. I. Vertical Chamber Oven and Producer

U. G. I. Water Gas Apparatus



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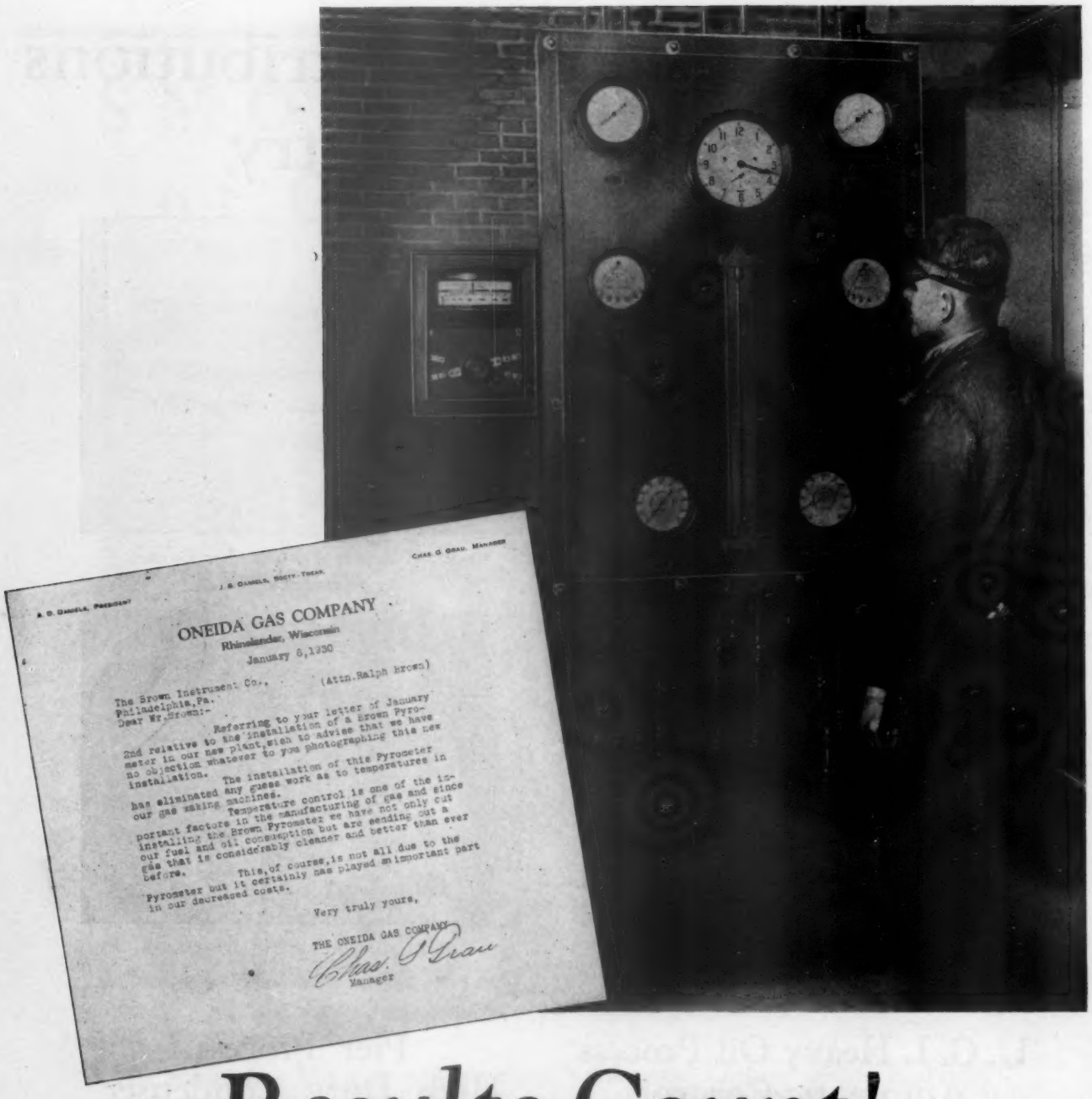

ONEIDA GAS COMPANY
Rhinelander, Wisconsin
January 6,1930

The Brown Instrument Co., (Attn.Ralph Brown)
Philadelphia,Pa.
Dear Mr.Brown:-

Referring to your letter of January 2nd relative to the installation of a Brown Pyrometer in our new plant,wish to advise that we have no objection whatever to you photographing this new installation.

The installation of this Pyrometer has eliminated any guess work as to temperatures in our gas making machines.

Temperature control is one of the important factors in the manufacturing of gas and since installing the Brown Pyrometer we have not only cut our fuel and oil consumption but are sending out a gas that is considerably cleaner and better than ever before.

This,of course,is not all due to the Pyrometer but it certainly has played an important part in our decreased costs.

Very truly yours,

THE ONEIDA GAS COMPANY
Chas. O Grau
Manager

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The experience of the Oneida Gas Co., Rhinelander, Wis., is typical.
Write for further information or quotations.

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Brown Pyrometers

To Measure is to Economize

Keeping Things Going

COOPERATION and competent engineering direction contribute more than any other factors toward keeping the gas plant in prime manufacturing condition.

It is through the applied methods of an able organization of engineers, that equipment and operating sequence are coordinated for the greatest good.

Building and operating coal carbonizing plants for more than twenty-five years, the application of this to your own problems, the knowledge, based on facts and figures and accruing from our wide and varied experience, is the definite service rendered by our organization.

Our service may be only an intelligent investigation of your needs with recommendations for betterment or, it may cover the investigation, recommendations and complete execution of whatever measures will prove most advantageous to profitable plant operating results.

Let Us Help You "Keep Things Going"

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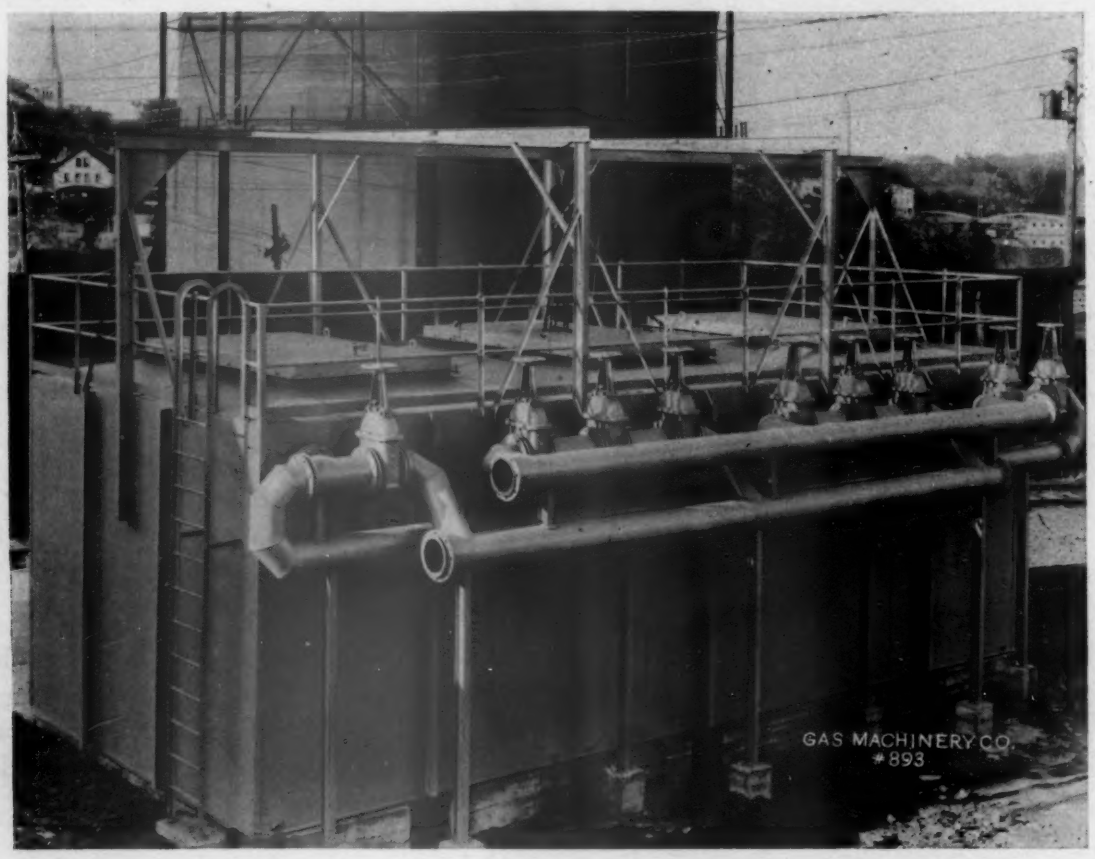
ARC-WELDED STEEL PURIFIERS

Insure Low Investment Costs and Satisfactory and Efficient Removal of Sulphur



The purifiers shown in above halftone were recently completed for a rapidly growing eastern company.

The structure is divided by two partitions into three purifier boxes and the flow of gas is controlled by the valve manifold designed to permit the flow of gas thru the several compartments in the following rotation:

A, AB, ABC,
B, BA, BAC,
C, CA, CAB,

and any one section may be cut out for cleaning and filling.

The reinforcement of the top deck and the covers is all on the underneath side, thus insuring against pockets for water to lodge in and cause depreciation by rusting.

Unloading is facilitated by three self-sealing side doors, each 3′ 8″ wide x 11 high, (one in each compartment).

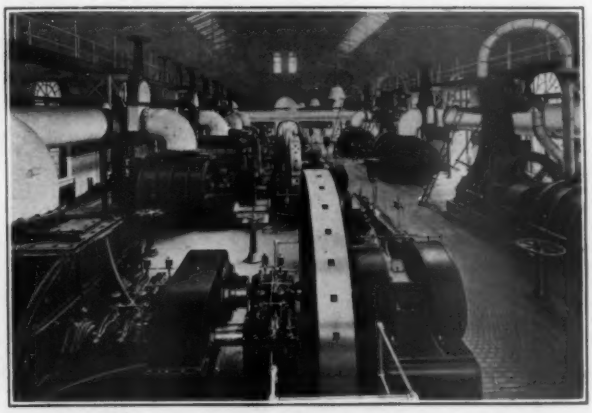
We shall be pleased to quote on your requirements.

THE GAS MACHINERY COMPANY

CLEVELAND, OHIO

Eastern Office: 812 Graybar Building, New York City

A Positive Gas Supply at Low Power Cost!



An installation of eight Connersville Gas Pumps in one room, capacities totaling 7,000,000 cu. ft. per hour.

Two Problems of the gas distribution engineer—maintaining a dependable gas supply for the consumer—and doing it economically—are both solved when he installs

Connersville Boosters

This is possible because of the inherent characteristics of Connersville Gas Pumps.

1. **The delivery of a definite volume of gas due to positive displacement per revolution.**
2. **Economy of operation as high efficiencies result in low power requirements.**
3. **Variable loads are economically handled by multi-speed motor or engine driven Connersville Boosters.**
4. **Low maintenance costs throughout a period of years.**

Connersville representatives will be glad to supply you with definite figures about Connersville Gas Boosters for your requirements. Ask for them.

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12th Street and Kentucky Ave.
Connersville, Indiana

20 N. Wacker Drive
Chicago

420 Lexington Ave
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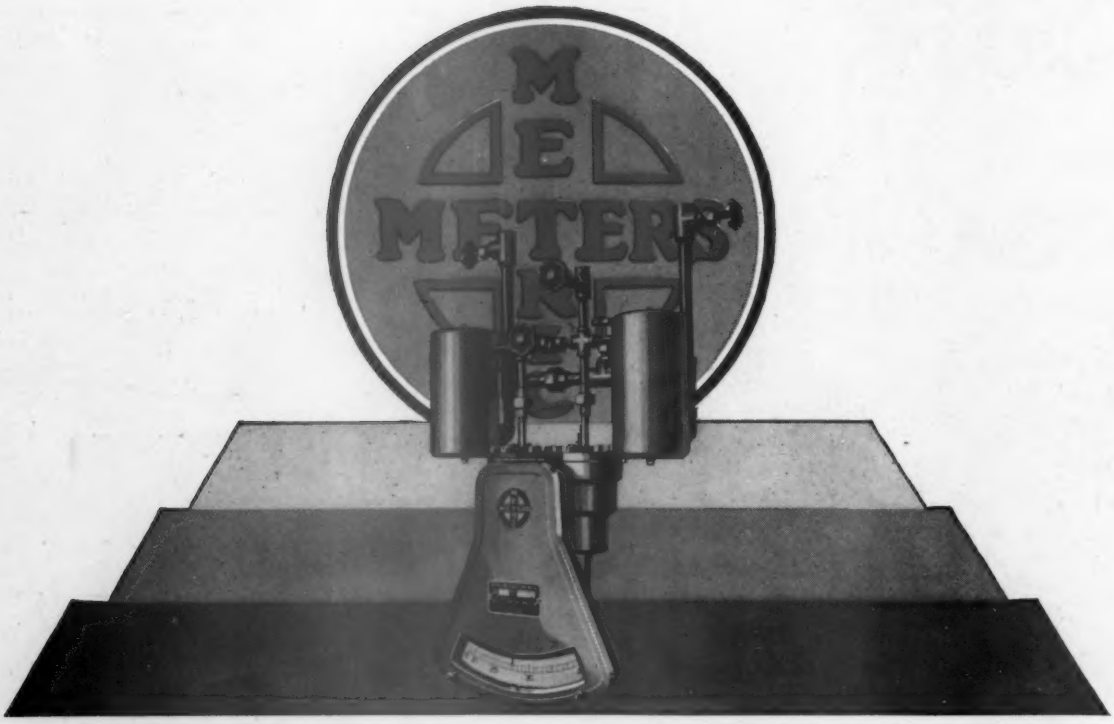
Blowers • Gas Pumps • Meters • Cycloidal Pumps



Measuring Flow Accurately—Economically

For measuring the flow ot gases and fluids accurately, meters must be sensitive to the slightest change and readily adapted to meet specific conditions. That is why Metric Indicating Flowmeters are made with interchangeable orifices — each accurate to one thousandth of an inch.

Metric Indicating Flowmeters measure the maximum flow of gas, oil, water, or air. Readings are indicated in cubic feet, gallons or barrels, per minute, per hour or per day. Special Metric orifice discs are provided so that the dials will indicate the rate of flow, without any calculations, either with flange or 2½ and 8 connections.

The dial numbers are large enough to be seen from a considerable distance. They are guaranteed to read from 0 to 10 or for any readings desired. To assure dependable service when you order new dials and orifices, the number and record ot each meter is kept in our files.

Let an American Meter Engineer cooperate with you on flow measurement. His knowledge is supported by extensive laboratory facilities and by experience practically applied in every part of the country.

For detailed information about Metric Indicating Flowmeters write for Bulletin E-3

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METRIC METAL WORKS
ERIE, PENNSYLVANIA
Ironcase, Tinned Steel Case and Orifice Meters

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The World's Largest Manufacturers of Gas Meters and Allied Apparatus
Established 1836

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for the

GAS INDUSTRY

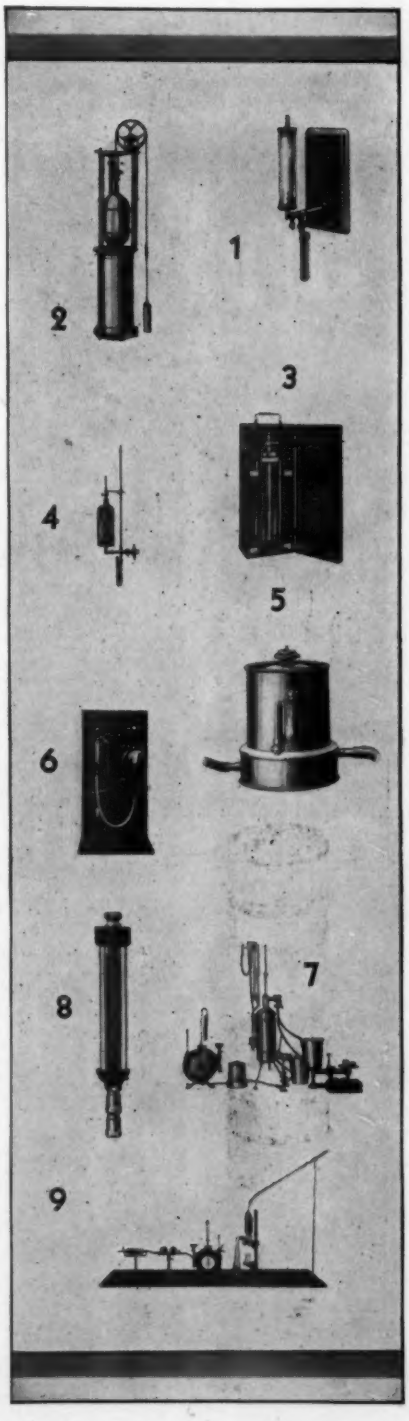
Chromium has proved its superiority over all types of plating that tarnish, stain, rust, corrode, wear or lose their lustre. Chromium plated equipment is now available to all users of gas apparatus.

Our protective plating is more than just a plate of chromium applied directly to the base metal. It is a triple plate first of copper, then nickel and lastly chromium. This produces a beautiful blue-white platinum-like color, the lustre of which is retained indefinitely.

Inert to sulphur and sulphur compounds, unaffected by atmospheric corrosion, chromium is the ideal plate and provides characteristics long desired by the consumer. Having longer wearing quality, and equal brilliance, chromium takes the place of nickel, silver, or platinum as a finish. No abrasives or polishing are required: simply wiping the surface with a damp cloth is all that is necessary to keep chromium plate bright.

Gas apparatus which may now be obtained in chromium plate is as follows:

1. **Chimney Type Hydrogen Sulphide Test**
2. **Cubic Foot Bottle (Immersion Type)**
3. **Specific Gravity Apparatus**
4. **Young's Sulphur and Ammonia Test**
5. **Calorimeter Wet Governor**
6. **1/10 Cubic Foot Bottle**
7. **American Calorimeter**
8. **Siphon Gauge**
9. **Referee's Sulphur and Ammonia Test**



AMERICAN METER CO. MEASUREMENT ENGINEERS CUBIC FEET

AMERICAN METER COMPANY

Incorporated

General Offices: 105 West 40th St., New York, New York

Established 1836

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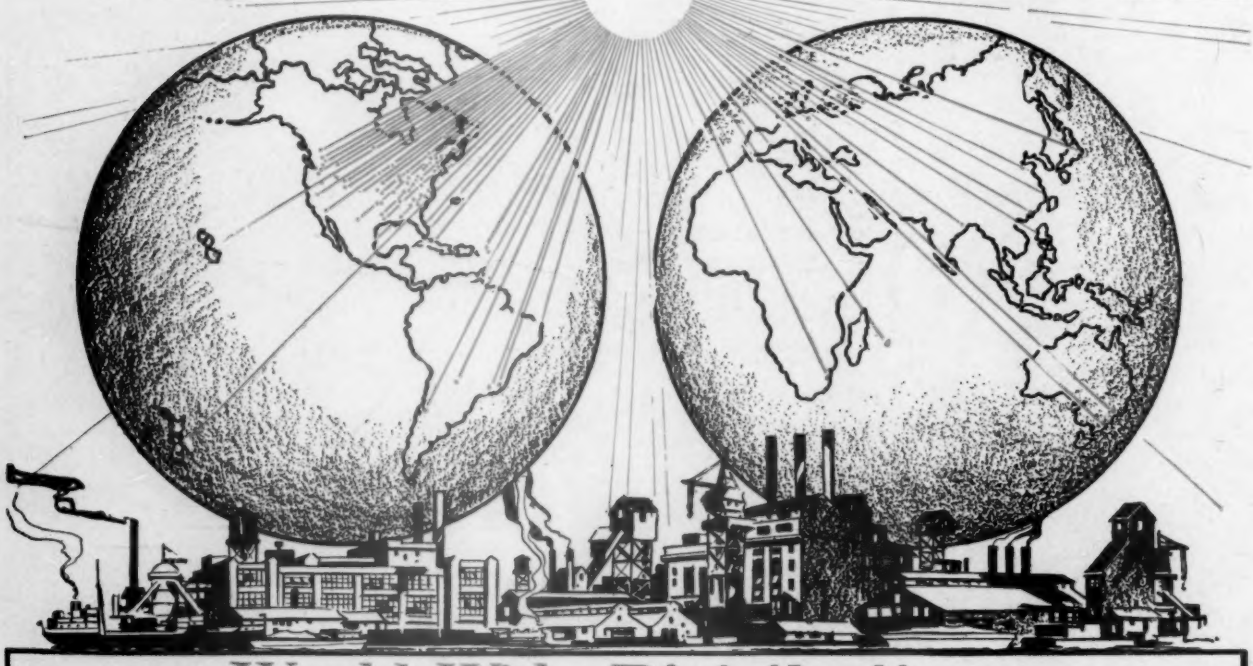
The Sun Never Sets on~ QUIGLEY SERVICE



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EVERYWHERE—throughout the Americas and at strategic points on both hemispheres, Quigley Distributors are located — carrying stock and giving speedy and satisfactory service. Quigley Products include:

HYTEMPITE

The Universal High Temperature Cement, which air sets at normal temperatures and retains its strength up to the point at which the best fire brick soften or fail. Used for bonding and repairing refractory structures and equipment. Mixed with refractory aggregates for furnace repairs, rammed-in linings, building and repairing baffles, making special shapes, etc.

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A highly refractory granular aggregate. Used with HYTEMPITE for furnace repairs, baffles, rammed-in linings, special shapes, etc. Shipped in 125 lb. bags.

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A plastic ready mixed cement for bonding and repairing acid resisting masonry and building acid proof structures. Used for acid towers, acid tanks and vats, pickling tanks, stacks, flue linings, ash pits, pipe joints, floor and wall tile, acid eggs, brick work and arches of waste heat boilers in smelters and places where hot acid gases and acid solutions are handled.

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Prevents corrosion of iron, steel, galvanized and plated surfaces. Protects, waterproofs and decorates all surfaces, including concrete, stucco, plaster, wood, cork, etc. Resists acid and alkaline fumes and solutions. Made in twelve stock colors, Black, Maroon, Green, Red, F. D. Red, Orange, Gray, Blue, Buff, Yellow, White, Aluminum and Clear.

Triple-A Black No. 10 for protection where decoration is not needed. Used on structural steel and on all types of industrial and engineering equipment. Also for breechings, stacks, boiler fronts, furnace doors, etc., and other places where similar high temperatures exist. Applied like paints. Dry quickly.

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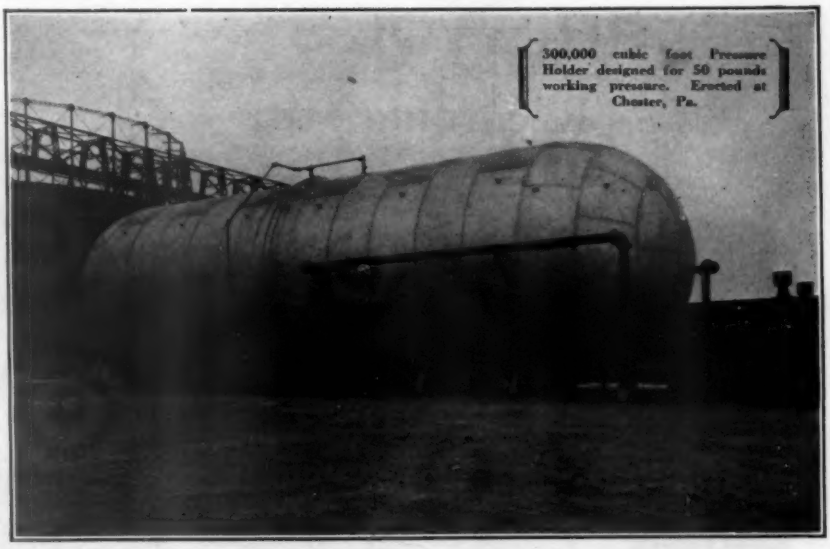
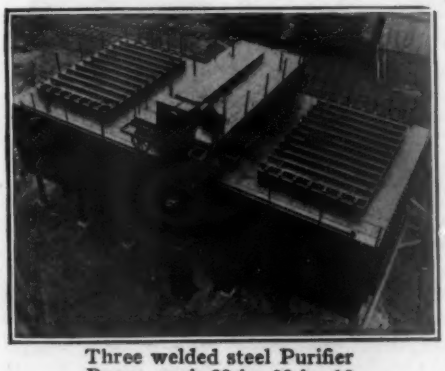
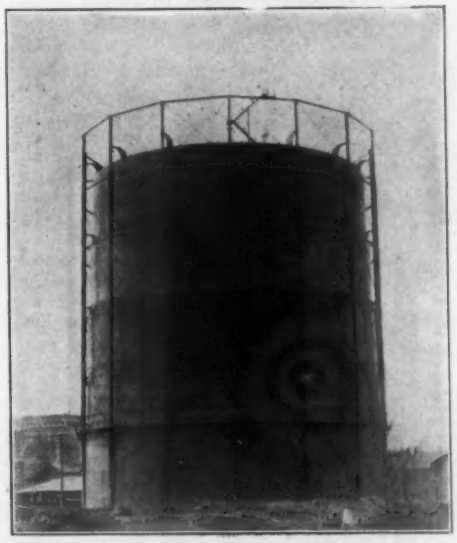


300,000 cubic foot Pressure Holder designed for 50 pounds working pressure. Erected at Chester, Pa.



Three welded steel Purifier Boxes, each 20 by 30 by 13 feet, arranged in one unit.



Two million cubic foot Holder erected at York, Pa.

In the building of Cruse-Kemper equipment no rivet is too insignificant, no weld too short, no test too much trouble to receive painstaking attention!

■ ■ ■ ■ ■

We believe that our reputation rests entirely on the performance of our units, on their doing a perfect job day after day . . . for years. And that belief influences every step from design to operation.

■ ■ ■ ■ ■

One conspicuous example is in the calking of all our gas-tight units—*every inch is calked as assembled.* As a result Cruse-Kemper Holders are tight from the moment gas is first introduced.

■ ■ ■ ■ ■

Design, construction and erection are so carefully done that the purchaser's costs are kept to a minimum, and the care we take pays for itself many times over.

■ ■ ■ ■ ■

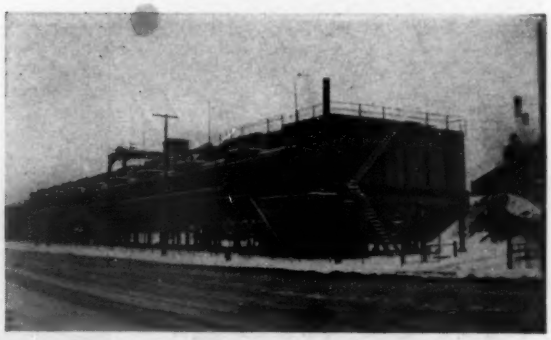
CRUSE-KEMPER CO.

AMBLER, PA.

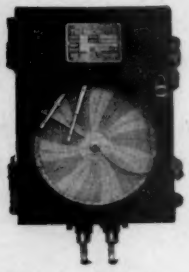
Manufacturers of GAS HOLDERS and other major equipment units for the GAS INDUSTRY

TRADE MARK
BRISTOL'S
REG. U. S. PAT OFFICE.

Recording
Thermometers
and Gauges
for



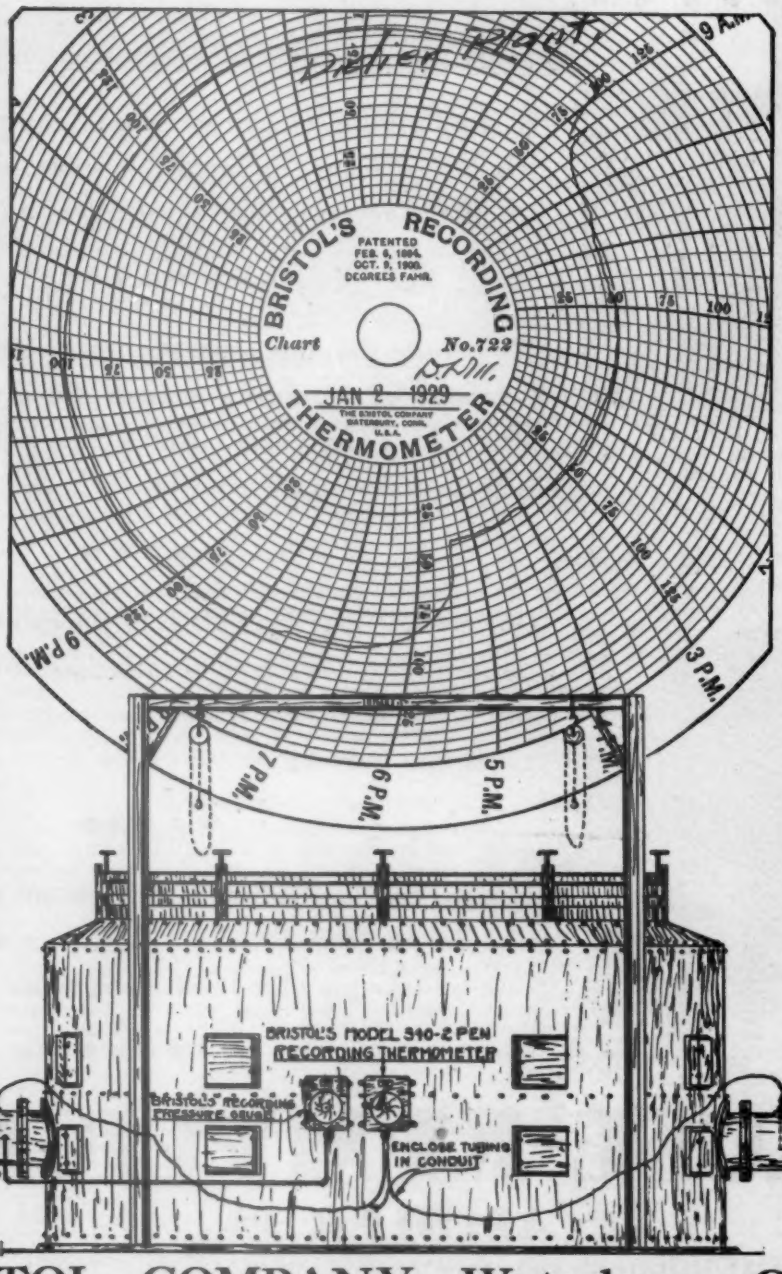
DRY BOX PURIFIERS!



Built to Withstand H_2S Corrosion

Bristol's Rectangular Form Recording Thermometer, Model 340, 24 hour clock; 8 or 12 inch charts (range 0-150° F.); is recommended for recording dry box purifier temperatures. The instrument case is moisture-, dust- and fume-proof; thoroughly capable of withstanding H_2S corrosion. The inverted chromium plated penarm arrangement is standard. Single or multiple pens can be furnished to suit requirements.

Continuous records of Inlet and Outlet temperature furnished by this Bristol's Thermometer aid materially in keeping temperatures within the close range required for efficient dry box purifier operation. The double record shows whether or not the reaction between H_2S and iron oxide is causing heating. A decrease in temperature differential indicates evaporation of water in the box.



Reveals Purifier Stoppages

Bristol's Rectangular Form Recording Pressure Gauge, Model 40; 24 hour clock; 8 or 12 inch chart (range 0-40 inches water head); is recommended for recording dry box purifier inlet pressures.

This instrument is moisture-, dust- and fume-proof. All parts are especially designed and constructed to withstand the corrosive materials about the gas plant. The inverted chromium plated penarm eliminates penarm corrosion. Operating records obtained with this instrument show all pressure changes occurring during each day or night's run. Any pressure build-ups which may indicate stoppages in the purifier can be detected almost as soon as they occur, and can thus be corrected before serious inefficiency occurs.

BRANCH OFFICES:
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Chicago Denver
St. Louis San Francisco

BRANCH OFFICES:
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Philadelphia Birmingham
Pittsburgh Los Angeles

The BRISTOL COMPANY, Waterbury, Connecticut

CONNELLY GOVERNORS

For Over Half a Century

We have devoted this long period of time—54 years to be exact—exclusively to the better purification of gas and its safe and economical control in distribution.

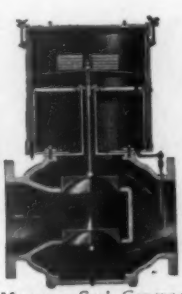
The service satisfaction only obtainable in the use of the right equipment in the right place is inherent in all Connelly Governors.

Every appliance bearing the Connelly trade mark is designed to meet definite needs in modern high and low pressure gas distribution, built upon this experience of over half a century in serving the requirements of the gas industry.

5-50 District Governor

Connelly Balance Governor

Automatic Station Governor



Mercury Seal Governor

Type D-C Service Governor

Back Pressure Valve

Special features found in no other type of Governor, with typical Connelly construction throughout, are a permanent guarantee of operating efficiency, safety and proof against leakage.

Strong, well-balanced construction, correct design, sensitive to the highest degree, they will prove to be the most satisfactory governing devices for the control of high, medium or low gas pressure.

Our Engineers are at your service to render any assistance relative to the purification or distribution of gas.

OUR OTHER PRODUCTS

Station Governors
District Governors
Service Governors
Compensator
Fuel Gas Governors
Gas Main Bags and Stoppers
Gas Testers
Jones Jet Photometer

Iron Sponge Precipitated

The Ideal Gas Purifier. Made in U. S. A.

Because of its dependability, Iron Sponge is widely used as standard purifying material. But in extraordinary cases where boxes are small and revivification is necessary, Iron Sponge Precipitated is recommended. It does not heat to a high point.

Counter Balanced Manholes
Back Pressure Valve
Gas-Tar Separators and Burners
Gas Tape
Respirating and First Aid Outfits
Pressure Gauges
Tools, Street Dep't Requisites
Millers Grip Packing
Gas Screen

CONNELLY IRON SPONGE & GOVERNOR CO.

CHICAGO OFFICE and PLANT: 3154 SOUTH CALIFORNIA AVE. **ELIZABETH, N. J.**

FROM 1500 AV. HOURS

TO

After conclusive proofs in which R&E #3000 High Temperature Cement obviated the necessity of re-laying gas machine brickwork in the clinker zone for 4500 average hours, it is evident that something new is happening in the gas industry.

R & E #3000

REFRACTORY CEMENT

(High Temperature)

R & E #3000 Cement withstands all the varying temperatures of gas machine operation. It is not only extremely effective at high temperatures but is equally efficient at low temperatures. #3000 Cement will neither puff, bloat, crumble or fall out when gas machine is off the line. Use it for hot or cold patching and for laying brick.

Why not let us tell you *all* the details about this unusual cement for gas plants?

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Engineering & Manufacturing Specialists in High Temperature Cements.

50 Church St., New York, N. Y.

Warehouses in

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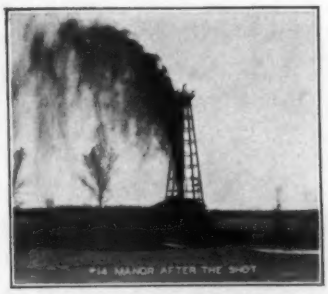
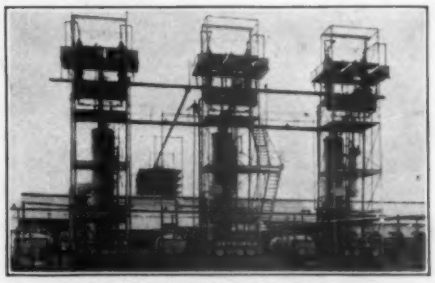
4500 HOURS

PHILFUELS PROCESS OF GAS MANUFACTURE

(PHILFUELS G4 BUTANE)



1—SOURCE OF SUPPLY



2—BUTANE EXTRACTION PLANT

1—Large reserves of raw material assure dependable supply.

2—Products of exact specifications from modern technically controlled plants.

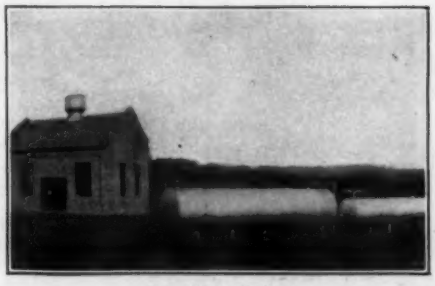
3—Fleet of special tank cars adequate for the requirements of the gas industry.

3—TRANSPORTATION

4—New and simple method of making gas.

5—Distributed and used the same way as other city gases.

Philfuels Company During 1929 Shipped Liquefied Petroleum Gases Equivalent to 1,150,000,000 cu. ft. of 530 B. T. U. Gas.



4—PROCESSING

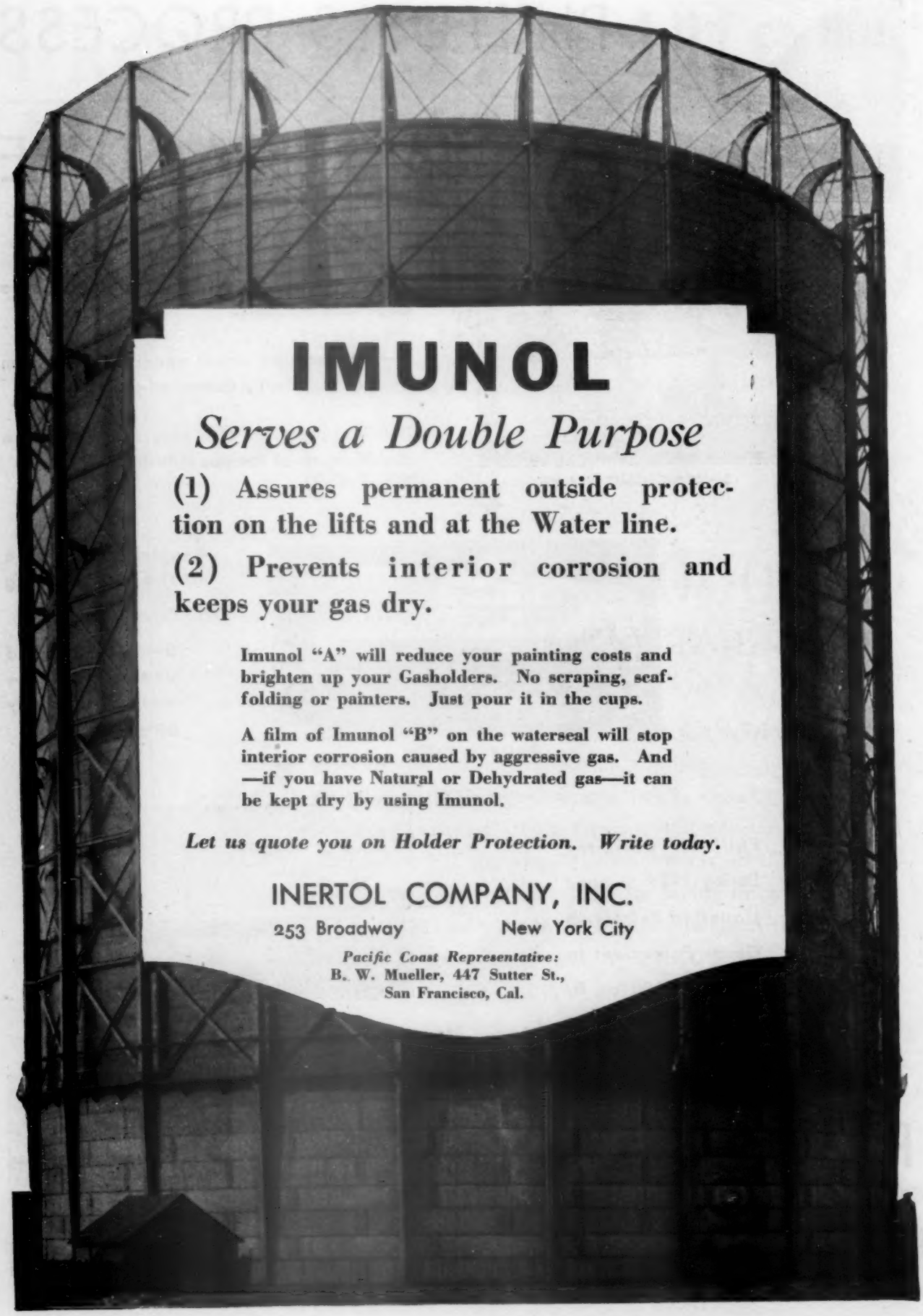
5—UTILIZATION

PHILFUELS COMPANY

Subsidiary of Phillips Petroleum Company

7-101 GENERAL MOTORS BLDG. » » DETROIT

« *Gas Manufacturing Division* »



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Serves a Double Purpose

(1) Assures permanent outside protection on the lifts and at the Water line.

(2) Prevents interior corrosion and keeps your gas dry.

Imunol "A" will reduce your painting costs and brighten up your Gasholders. No scraping, scaffolding or paimters. Just pour it in the cups.

A film of Imunol "B" on the waterseal will stop interior corrosion caused by aggressive gas. And —if you have Natural or Dehydrated gas—it can be kept dry by using Imunol.

Let us quote you on Holder Protection. Write today.

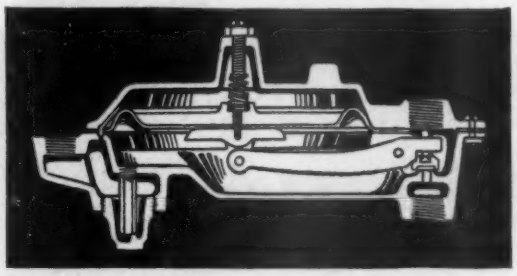
INERTOL COMPANY, INC.

253 Broadway New York City

Pacific Coast Representative:
B. W. Mueller, 447 Sutter St.,
San Francisco, Cal.

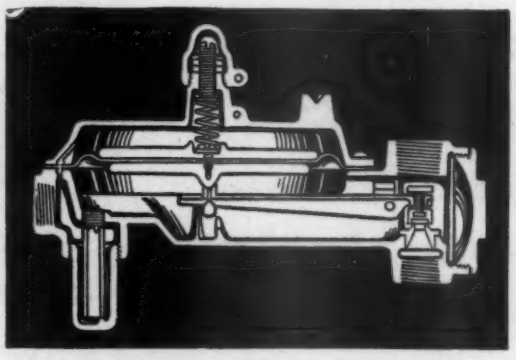
Built to Fit Specific Needs » »
REYNOLDS Three Service Regulators

MODEL O



MODEL O SERIES—With or without Mercury Seal in Spring Type Regulators

MODEL 10



MODEL 10 SERIES—With or without Mercury Seal, Dead Weight or Spring Type

38 *Years' Experience*
« « Sound Design » »
Dependable Performance

Note below the individualities in the three REYNOLDS Units. Model 0—the old Standard—has successfully served for a quarter of a century » Model 10—all working parts are so accessible as to be interchangeable without removal from pipe line » Model 20—all working parts are so accurate as to permit complete interchangeability in the shop » The lever on both the Model 10 and Model 20 is of Parkerized steel which prevents corrosion, also a smaller lever bearing surface increases sensitivity » The dead weight non-adjustable type is available in Models 10 and 20.

WRITE FOR COMPLETE DETAILS

REYNOLDS PRODUCTS

for all kinds of Pressure Reductions » » for either artificial or natural gas.

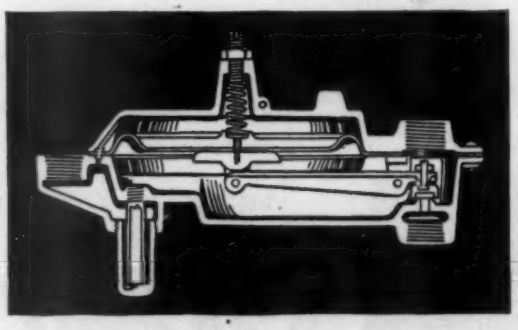
GOVERNORS » »
- Intermediate Pressure
- Triplet Outlet
- Holder
- Toggle Type Street

REGULATORS » »
- High Pressure Service
- Low Pressure Sevice
- Intermediate Pressure
- High Pressure Line
- Single and Double District Station

VALVE » »
- Automatic Quick-Closing Anti-Vacuum

SEALS » »
- Mercury
- Dead Weight

MODEL 20



MODEL 20 SERIES—With or without Mercury Seal, Dead Weight or Spring Type

Reynolds Gas Regulator Company
Anderson, Indiana

Reynolds Branch Office, Room 422 Dwight Bldg., Kansas City Mo.

REPRESENTATIVES

EASTERN SERVICE CO. Boston, Mass.

F. E. NEWBERRY Avon, N. J.

THOS. C. CORIN Detroit, Mich.

RECOGNIZED GAS CONTROL SINCE 1892

"For every joint on every line"

Ten miles or a hundred—Victaulic-coupled lines assure 100% delivery—because there are no joint leaks.

Installation costs are amazingly low.

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Mail the Coupon for Victaulic Bulletin

For all sizes of steel, wrought iron, cast iron and spiral weld pipe—any pressure. Mail the coupon for detailed information.

VICTAULIC COMPANY OF AMERICA
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FLEXIBLE LEAK-PROOF

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Please send me Victaulic Bulletin No. 7

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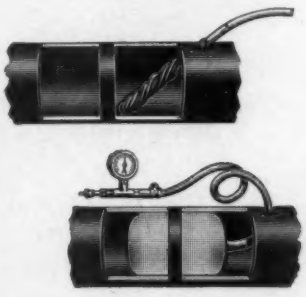
— STOPPERS SINCE 1897 —

TYPE "C" CANVAS-COVERED GAS MAIN BAGS



For use in mains coated with tar or oil or wherever a plain rubber will not hold.

SIZES 2" TO 48"

DEPENDABLE GAS MAIN BAGS

Made in three types:

Light—Type "A"
Medium—Type "B"
Extra Heavy—Type "D"

We advise the use of a gauge showing the internal pressure in the bag. It prevents over-inflation and shows that the bag is holding.

HOW TO USE THE GOODMAN STOPPER

INSERT IN TAP LIKE THIS
TURN TO RIGHT LIKE THIS
ENGAGE Z HANDLE IN TAPPING
PULL LONG HANDLE TO YOU
LOWER LOCKING SLEEVE
AND LOCK IN PLACE
LIKE THIS
WHEN LOCKED IN PLACE IT HOLDS

Takes only 30 seconds

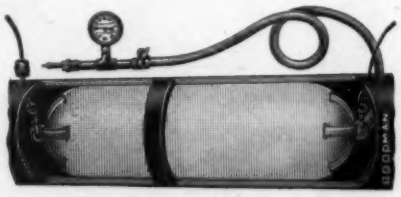
Patented Locking Sleeve
Holds Stopper firmly in place

GAS SAMPLING BAGS

On trial if you wish

GOODMAN CYLINDRICAL STOPPER FOR INTERMEDIATE PRESSURE

To place and inflate requires less than one minute



Patented
Increased Length for Increased Pressure

AIR-LINE MASK

With or without blower. Heavy harness and life-line if needed

SPRING-HEEL PLUG

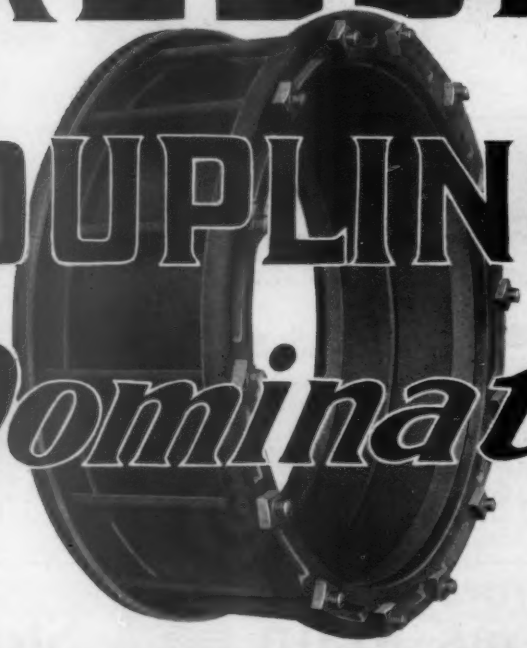
Type No. 6 for right angle fittings

Type No. 7 for 45° fittings
Other Plugs for Various Uses

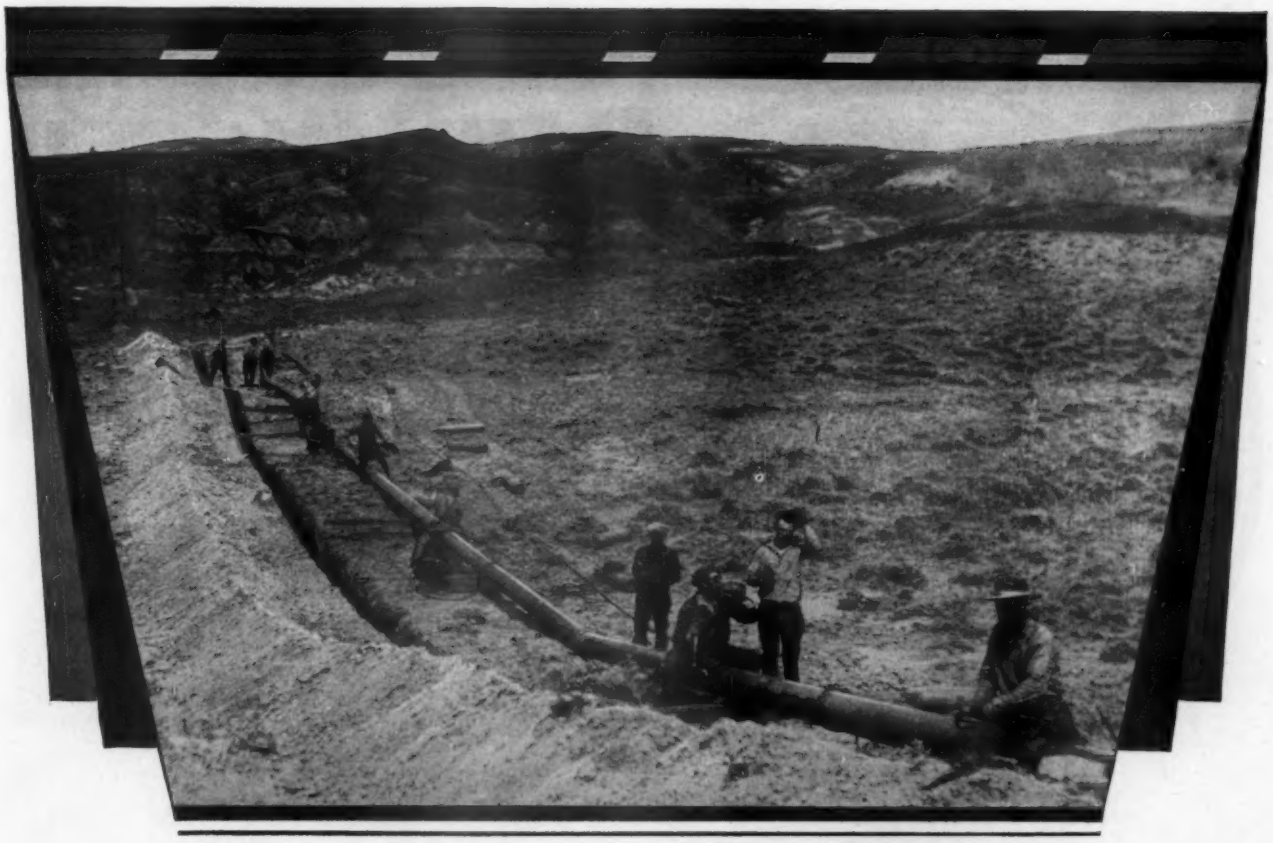
Safety Gas Main Stopper Company
523 Atlantic Ave. Cable Address **Gastopper, N. Y. Brooklyn, N. Y.**

Over 100,000 miles of Dresser coupled pipe lines—mostly in *high pressure* systems—bear constant witness to the fact that Dresser Couplings remain permanently tight.

DRESSER COUPLINGS *Dominate*



1880 S. R. DRESSER MANUFACTURING CO. 1930
BRADFORD, PENNA.



• • • • • • TO PRODUCE DEPENDABLE WELDS

IN welding gas and oil pipe lines selection of materials and instruction in correct welding technique are important factors of good welding practice . . . Under Linde Procedure Control careful and studied selection of materials and application of proven methods make oxwelded joints as strong as the pipe and permanently leakproof — 100 per cent efficient.

THE LINDE AIR PRODUCTS COMPANY . . . THE PREST-O-LITE COMPANY, INC. . . . OXWELD ACETYLENE COMPANY . . . UNION CARBIDE SALES COMPANY,

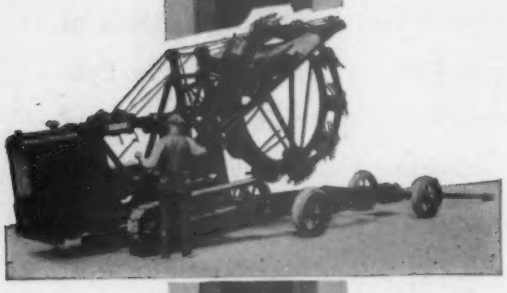
Units of UNION CARBIDE AND CARBON CORPORATION

General Offices . . . . . New York UCC **Sales Offices . . . In the Principal Cities**

65 Linde plants . . . 48 Prest-O-Lite plants . . . 174 Oxygen Warehouse stocks . . . 156 Acetylene Warehouse stocks
42 Apparatus Warehouse stocks . . . 245 Union Carbide Warehouse stocks

THE CLEVELAND BABY DIGGER

Precision Built to Advanced Design



Maximum Trench Footage at Minimum Cost Because

INCHES COUNT!

The Baby Digger, because of its compactness, is the indicated trencher—with its extreme width of 58 inches. It gives you machine trench-digging economy where expensive hand-labor would be the only other possible method.

POUNDS ARE IMPORTANT!

Again, the Baby Digger, comparatively light in weight, carrying no unnecessary poundage, weighting only four tons, delivers 100%—evidently a safer and easier machine to handle when working over sidewalks, lawns, drives and soft ground.

MOBILITY IS ESSENTIAL!

The Baby Digger, loaded or unloaded on its own specially built trailer in five minutes, gives maximum mobility—assuring more productive time and more trench dug.

DURABILITY IS DEMANDED!

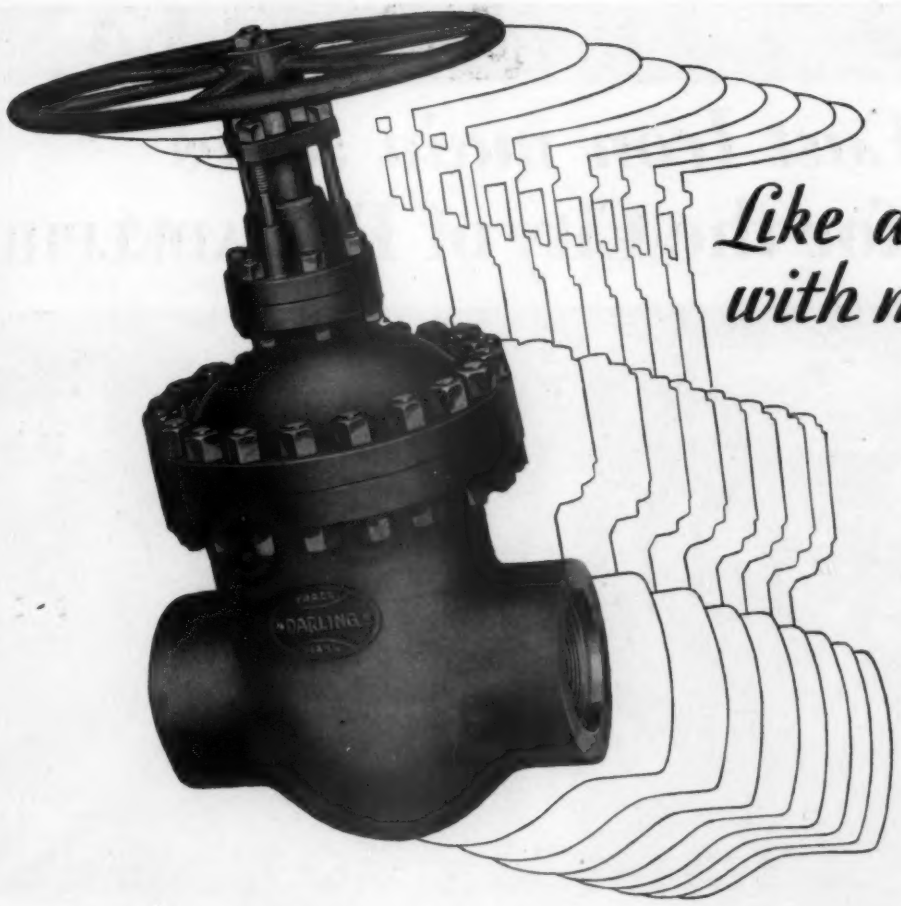
With a design as modern as tomorrow, yet tested and proved by the experience of nine years, the Baby Digger meets squarely the demand for durability. Its rugged wheel type performance, mounted on full crawler tracks, is backed by a construction that utilizes to the fullest extent modern anti-friction bearings, bronze worm gear reductions, alloy steels, etc.

Write today for full information.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Avenue **Cleveland, Ohio, U. S. A.**



Like a cat with nine lives

DARLING
GATE VALVES

Darling Outside Screw and Yoke Forged Steel, Flanged End Gate Valve, Dar-o-loy trimmed.

When the Darling Valve is made—it is made skillfully and with the most flawless material—which means just this to you—you get a valve that will outlive your most optimistic expectations, a big saving in valve cost, in repair cost, and in production time.

Darval Semi-Steel Flanged End Gate Valve, Dar-o-loy trimmed. Made in all sizes for general field use.

Darling Valve & Mfg. Co.

Williamsport, Pa.

NEW YORK CHICAGO OKLAHOMA CITY HOUSTON

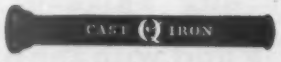
A Cast Iron main saves $70,000 for the City of PHILADELPHIA

Fairchild Aerial Surveys, Inc.

THE City of Philadelphia saved $70,000 by digging up an abandoned 48″ cast iron pipe line and relaying it in another location. This pipe line was originally put down in 1888. On examination it was found to be in excellent condition. Consequently the entire line was relaid in a new location where it is expected to serve for 75 or 100 years longer.

Cast Iron Pipe in large and small diameters has been serving the people of Philadelphia and saving them money for more than 100 years. A recent letter from the Chief of the Water Bureau states: "We have cast iron pipe laid in 1822 (8″) and 1827 (6″), both of which appear to be in good condition."

The reason why Cast Iron pipe serves for centuries is because of its effective resistance to rust and corrosion. Gas and water mains of ferrous metal (iron and steel) with the exception of *cast iron* disintegrate from rust. Cast Iron pipe is the only ferrous metal pipe practicable for underground mains which rust will not destroy.



The "Q-check" symbol shown above has been adopted as the trade mark of The Cast Iron Pipe Research Association.

CAST IRON PIPE

Engineers, contractors and city officials desiring detailed information on the efficiency and economy of Cast Iron pipe for water and gas mains, sewers, road culverts or industrial uses are invited to write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 People's Gas Building, Chicago, Ill.

Cast iron pipe bearing the "Q-check" trade mark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Company, 11 Broadway, New York.

ABOVE: Fourth Dimension Photo of a city of the Future Hidden in Wartime by its Protective Curtain of Sub-Infra Red Invisibility Rays

UNSEEN SERVICE!

In the above city are countless Roots Pumps, Blowers and Meters, giving perfect service even though their performance is unwatched.

Roots Units can be depended upon to handle any job for which they are specified, with maximum efficiency and minimum power and upkeep.

OUR BULLETIN 10-B1 GIVES YOU THE STORY BRIEFLY. WRITE FOR IT.

"ROOTS Users Root for ROOTS"

ROOTS Rotary Positive Displacement

BLOWERS GAS PUMPS METERS

BOOSTERS EXHAUSTERS GOVERNORS

BLAST GATES

PRODUCTS

The P.H. & F.M. ROOTS CO.

CHICAGO Peoples Gas Building

CONNERSVILLE, INDIANA

NEW YORK 420 Lexington Ave.

THE BARTLETT HAYWARD COMPANY

Main Office and Works
Baltimore, Md.

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DESIGNERS AND BUILDERS OF

Complete Coal Gas Plants

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B. H. Co. Vertical Centrifugal Scrubbers
(Feld Type)

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(Genter Type)

Steel Tanks

Vertical Waste Heat Boilers

B. H. Co. Westling Valve
(Patent Applied For)

Fast's Flexible Couplings

GAS HOLDERS

THE BARTLETT HAYWARD COMPANY'S MAIN PLANT

AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900

HENRY M. RILEY, Editor

Time To Go To School Again

OF LATE many gas men have been prone to consider the production problems of the Industry as being rather well defined and entirely in hand. With this idea in mind they have given a great amount of attention to the utilization and selling phases. But, it would seem that the production man's worries are by no means to be brushed hastily aside by a mere statement. Things are happening, so to speak, which demand that he exercise his mental ingenuity at a greater speed than heretofore, if such a thing were possible.

It is true that the art of making water gas or coal gas or any other manufactured gas is tolerably well defined and governed, within reasonable limits, by well known basic facts which any energetic and qualified production man can apply. In other words the production man "knows his stuff" so far as the particular gas he is making is concerned but, figuratively speaking, he might have to turn in and supply a different kind of gas over night to the distribution system. Obviously his personal ease of transition will be considerably enhanced if he has more than a passing knowledge of the new gas to be distributed.

A half a dozen or so years back the piping of Natural Gas to such important urban centers as New Orleans, Memphis, Atlanta, St. Louis and other points being served with Manufactured Gas would have seemed rather out of the question. And only a couple of years ago the impending use of Propane and Butane on a large competitive scale would have doubtless been classed in the category of wild dreams. But both have come to pass.

The production man is generally the first individual called in to discuss with the management the feasibility of a change-over to a new kind of gas. Accordingly, he must be armed with a mass of exact economic figures and calculations, all of which presuppose a fairly intimate knowledge of the new gas under consideration. He cannot with safety even attempt to estimate, let alone guess—he must know the facts. Such knowledge perforce can only come from a careful and painstaking study of the entire roster of available gases. And once a change-over is made to another gas the production man must not think that he can forget about the former gas sent out. Thus, for example, when a particular company supplants Carburetted Water Gas with Natural Gas the production man should especially refrain from tossing his library of Water Gas books out of the window and entirely bidding farewell to the subject.

The production man's problems are by no means entirely solved. Indeed, it appears that he is in for a right strenuous session of study.

World's Tallest Building Piped for Gas

THE new Chrysler Building in New York City now ranks first as the world's tallest structure. This architectural achievement whose imposing tower rears its head 1046 feet above the din and bustle of a great metropolis, has been adequately and completely piped for gas. Regardless of the floor level, every tenant may enjoy the benefits of gas when he so desires.

From the basement to the seventieth floor, with take-off tees at every floor level, runs a six inch riser. The length of this riser is 777 feet, practically all of which is vertical. An additional riser, four inches in diameter, extends from the basement to the twenty-second floor. This latter is approximately 250 feet in length.

There is a gas outlet on the seventy-first floor to take care of the fuel needs of a small restaurant. This restaurant, when in operation, will be the loftiest in the world, measured from the sidewalk level, to be supplied with gas. On the sixty-sixth floor the exclusive Cloud Club whose membership will include many of the country's wealthiest captains of industry, will have its tempting dishes prepared largely by gas, the pipe to the meter being two inches in diameter.

Future restaurants, barber shops and similar undertakings will be assured a plentiful supply of the "perfect fuel" in this remarkable building.

Comments Regarding Paper on "Theoretically Correct Gas Plant"

A. M. BEEBEE

General Superintendent, Gas Dept., Rochester Gas & Electric Corporation

Selecting an ideal gas plant was the theme of an exceedingly valuable report made by Mr. F. W. Steere at the 1928 A.G.A. convention. Management officials and engineers who studied that report have undoubtedly profited by it. Naturally there have been many questions raised by the study of the paper.

American Gas Journal feels much gratified that it is privileged to present such a creditable review and interpretation of the original document, prepared by Mr. A. M. Beebee, and by other well known gas engineers. Serious attention to the fundamental principles in Mr. Steere's presentation will be rewarded generously by a better understanding of gas-plant economics. We commend the particular study by Mr. Beebee and his associates for the thoughtful consideration of readers of the Journal—Editor

IT has always been the history of the world that whenever a thinker developed a new line of thought he has usually been attacked, sometimes most critically and oftentimes unfairly. Therefore, possibly this paper may be classed merely as history repeating itself.

At the meeting of the A. G. A. at Atlantic City in 1928 Mr. F. W. Steere presented most ably a paper under the title "Theoretically Correct Gas Plant" which paper outlined a fundamental conception of our industry not often realized, in a very commendable manner and on which Mr. Steere is to be most thoroughly congratulated. Any who have not read the paper can well afford to do so, and the industry at large has been greatly benefited as a result of the efforts of Mr. Steere, as no doubt he has also.

With such an introduction you can all read between the lines that there must be a "but" or "catch" in it and we will not delay longer to raise some fundamental points which, in developing this paper, we feel should be considered and which it is felt have not been stressed.

Mr. Steere's paper is very handily made out so that in case you do not care to adopt his premise you may substitute those that you may choose yourself. In other words, in the main, he has devised a form and not a specific set of data to apply in all cases. In his own words he has offered a method and not a solution. However, he has drawn therefrom some rather definite conclusions which constitute the basis of and reason for this paper.

One of the main benefits of Mr. Steere's paper is the emphasis that it places on the credit for the coke sold by a coal gas plant. No wiser or truer advice could be given but where it is felt that his conclusions need further consideration has been as a result of the development of what constitutes the proper value of his coke credit. Perhaps this is the field of another paper and if so, then this paper is offered in that light.

In other words the points developed in Mr. Steere's paper which we are going to challenge are as follows:

I use the word challenge because I have become a tremendous admirer of Mr. Steere on account of his courage to seemingly enjoy assailing things which seem formidable. I enjoy that type of warrior be it in athletics or what not and therefore I am attempting to imitate him in that respect. Mr. Steere's paper directly or indirectly assailed two very formidable principles.

(a) That coal gas is the proper gas for base gas.

(b) That gas made by a producer gas fired coal gas plant is cheaper than an oven gas fired plant.

In attempting to substantiate our side we will attempt to use Mr. Steere's own figures rather than quibble over some of the finer details which lead to the conclusions, for it is feared that discussion of the smaller details will lead to endless argument and confusion. If the battle cannot be won on fundamental ground it might better be called a draw. In other words, we will not criticize the details of his report and the details of his figures, but rather the conclusions drawn therefrom. By this statement we do not wish to imply that the development of the details of Mr. Steere's report are beyond criticism, rather the contrary, since there are several items which tend to throw coal gas in an unfavorable position which will be outlined later and which it is felt ought to be revised in order to get a true picture. The point is that we feel we can still justify our position without having to resort to criticism of those details.

In considering such a discussion we must deal with fundamentals which are typical rather than extremes for unquestionably there are cases where either side is 100% correct and the other 100% incorrect. What we shall attempt to show is that Mr. Steere's conclusions may be correct as a matter of expediency or in unusual conditions but that they are not general or typical of the American gas industry. We shall discuss these two problems Part A and B in some detail and in Part C further offer some comments with regard to the matter which this paper has brought up, which we feel has lead

to the conclusions offered by Mr. Steere.

PART A

(A) *Coal gas is best suited as base load gas.*

Points to be considered as a premise of this discussion are as follows:

1st—In order for a coal gas plant to show to its best advantage, it must be designed with definite regard to the coke absorbing capacity of the particular community under consideration just as much as it should be designed to fit the gas demand of that community.

2nd—That coke absorbing capacity should be a steady reliable customer whose demand is not seriously affected by industrial depression. A public utility whose rates cannot follow the ups and downs of an industrial market cannot wisely depend on the industrial coke market as its coke absorbing capacity except in rare instances. It is too erratic and too irregular.

3rd—Is there a coke absorbing capacity that is steady and reliable? The answer is that there generally is—namely—the domestic fuel market. It is steady in its demand and remarkably uniform in its price and therefore it is a very desirable means of coke disposal.

However, it is very important that the coke production of the plant in question not exceed, except in rare instance, the coke absorbing capacity of the domestic market if maximum return over a long period of years is desired.

When these points are considered in plant design a coal gas plant will develop a coke credit which is very attractive. I do not feel that our case in Rochester where there is a differential between coal cost and coke credit of over $4.45 is exceptional. Assume that only $3.00 is possible as an average and apply this to Mr. Steere's table given in Appendix II which corresponds to a coke credit of $8.00, since in his table the coal cost is assumed at $5.00 and we find coal gas will cost 44c for total cost as compared with water gas of 54c.

If we use a differential of $4.45 such as we have in Rochester and use Mr. Steere's table with a coke credit of $9.45 the total coal gas costs become slightly under 31c as compared with water gas at 54c. Mr. Steere's original table will be found attached to this paper as Appendix II.

In fact according to Mr. Steere's own figures the differential between coal costs and coke credit must drop to $2.00 before coal and water gas become similar in costs. In a coal gas plant designed for its local coke absorbing capacity such a differential as $2.00 is ridiculous. It is only when the coal gas plant produces coke in excess of its local market to absorb and must ship its coke elsewhere, compete with other coke producing plants and dump its coke on the market that any such differential as $2.00 is justified. Such a situation is entirely the result of improper design in the type of the plant and coal gas should not be criticised when the designer installed a 6" I beam when an 8" was what was required.

Summary to Part A

It is these facts which make us firmly believe that coal gas from a properly balanced plant is bound to be the more economical type of base load gas except in very rare instances.

PART B

(B) *Producer Gas fired plant more suitable than oven gas fired type.*

In order to develop this part of the discussion we must preface our discussion with the following point.

Mr. Steere's premise as evidenced by plate No. 10 for conversion costs for Producer Gas fired type of plant shows approximately 10c per M higher than an oven gas fired type of plant as evidenced by plate No. 3. This difference is definitely refuted and it is difficult to tell why Mr. Steere's figures are in error, since no evidence is offered in his paper substantiating his curves. However, we have taken his Case I figures for straight coal gas plant and added to it costs for producer gas firing and the resultant increased conversion costs divided by the larger amount of gas available for sale results in a conversion cost which is slightly less than the oven gas fired type of plant. This detail is shown in Appendix No. 1 which Mr. Vittinghof of Stone & Webster has kindly presented. Also we will later offer further evidence to show why this should be expected.

Mr. H. W. Battin of the United Gas Improvement Company has offered some very fine comments on this point and has very clearly shown this point in a table which he has prepared, which will be found in Appendix III.

However, let's assume Mr. Steere's premise to be correct and see if we can establish ourselves without questioning this point, even in spite of this disadvantage of 10c per M which is an awful handicap to give.

With regard to this second principle under discussion—namely—*a Producer Gas vs. Coal Gas fired coal gas plant,* again we will resort to fundamental premise as a basis of our attack.

1st—According to the record of the Statistical Department of the American Gas Association of 12 representative gas utilities, the total Annual Gas Sales per Customer run from 34.8 M cu. ft. as a minimum to 44.0 M cu. ft. as a maximum with an average of 38.6 M cu. ft.

2nd—According to these same records the cities which have coal gas plants have developed domestic coke sales per meter ranging from zero to a maximum of 1.7 tons coke per meter. In this latter figure it is not felt the maximum has been reached but it does represent what is possible as a result of reasonable effort and since there are several companies who have developed coke markets all of which very closely approximate this figure, it may safely be taken as typical of the domestic market, where an effort is made to serve the domestic market.

3rd—Now a coal gas plant producer gas fired produces 12,400 cu. ft. of gas per ton of coal and 1100 lbs. of coke per ton of coal. Suppose we take the annual sales per meter of gas at 38.6 M and divide by 12.4 M per ton of coal we get 3.16 tons of coal per year required to make the gas for that meter. This 3.16 tons of coal × 1100 lbs. makes 1.74 tons of coke which is exactly the domestic coke absorbing capacity of that meter of 1.7 tons as indicated from the above A. G. A. statistics. In other words, the coke and gas production in the producer gas fired type of plant balances the coke and gas absorbing capacity of the typical community. The chances of the coke absorbing capacity increasing permanently above the figures of 1.7 tons as above given are doubled since beyond a certain point our house heating gas is in competition with our coke. In other words our gas and coke are competing with each other. If this point is worthy of consideration, in the case of the Producer Gas fired type of plant, then this point further places the oven gas fired plant with its excess coke pro-

duction at a still further disadvantage as will now be shown.

4th—Now let's see what happens when we consider the oven gas fired type of coal gas plant. The oven gas fired type of plant according to Mr. Steere's paper produces 7,700 cu. ft. per ton and 1500 pounds of salable coke. Again take our 38.6 M annual sales and divide by 7,700 and we get 5 tons of coal required which will produce 3.76 tons of coke per meter where the coke absorbing capacity of that meter is only 1.7 tons.

In other words, the oven gas fired plant produces coke in tonnage over twice as much as the stable high priced, desirable market can absorb. This excess coke must seek other markets in competition with other producing plants and in addition must absorb the freight and handling charges. Further the excess coke is often sold at dump prices. It is practices such as this which result in a low coke credit and bring about a $2.00 differential between coal cost and coke credit. In these days with the large number of coal gas installations it is important that each plant plan to stay within its own boundary, *since in that boundary it can reign supreme with a maximum of coke credit, if for no other reason than the protection offered by freight rates.*

Now let's assume that in the case of the oven gas fired plant half the coke will enjoy the same credit of the producer gas fired plant, but the other half must compete in other markets and must generally absorb handling and freight rates which will total $3.00 a ton, or an average of $1.50 a ton less for the coke credit of the oven gas fired plant as compared with the producer gas fired plant. These facts paint an entirely different picture when comparing an oven gas fired plant with a producer gas fired plant in Appendix II.

It is ventured to say that it is following the policy of an oven gas fired plant which has led Mr. Steere to the pessimistic viewpoint with regard to the future of coal gas as a base load plant.

In considering this point while looking at Mr. Steere's table we must compare Case 3 with Case 4 since Mr. Steere admits Case I, because of its inflexibility, is not a practical type of plant. Of course we feel that Case I with a producer gas fired type of plant is sufficiently flexible so that a large auxiliary water gas capacity is not necessary and therefore it might be considered. However, again we will neglect this point for the time being and a glance at the table will show that $1.50 decrease in coke credit brings the two types of plant on a similar cost basis.

Summary to Part B

It is an analysis of these points which indicates that from the gas industry's point of view the producer gas fired oven plant is fundamentally correct, even when considering Mr. Steere's figures which include a handicap of some 10c per M which we are convinced is wrong as will be later shown and which is clearly proved in an excellent manner in the Appendix by Mr. Vittinghof and in Appendix III by Mr. Battin.

In other words, up until now we have attempted to establish our conclusions by using Mr. Steere's own figures and premises without resort to criticism of the premises of his figures, even though we do not agree with them.

If we substitute figures which we feel to be more nearly correct then our conclusions are that much more evident. In the following Part "C" we will endeavor to outline the premises which we feel are subject to revision.

PART C

(C) *Further comments regarding Mr. Steere's paper and the matter of coal gas and producer gas fired types of plants.*

1st—It is felt that the following points used as a premise in Mr. Steere's paper are worthy of revision, as the present set-up is in a measure responsible for the conclusions reached.

2nd—The write-off used for coal gas plants we believe to be unusually severe.

3rd—The conversion cost for a producer gas fired type of plant we feel as not reflecting the true condition which we will later outline a little more in detail, and which is clearly covered in Appendices 1 and 3 in an excellent manner by Messrs. Vinntinghof and Battin.

4th—The coke yield when meeting a domestic market as shown in the case of an oven gas fired plant is questioned.

Mr. Steere's paper states as follows:

"One of the great problems of the utility business is the high ratio of investment to gross revenue. A gas company turning over its capital once in 5 years can never expect to become a material factor in furnishing fuel to industries which turn their capital over four or five times in one year."

The significance or merit of this point is not entirely clear and further a comparison of the gas utilities turnover with the coal, oil, and electric industry shown in Mr. Battin's paper (Appendix 3) shows that it compares quite reasonably with these industries which are the ones with which we are in competition.

5th—Mr. Steere's 4th case wherein he shows that the costs per M of gas from a producer gas fired type of plant are grossly in excess of the oven gas fired type of plant, assuming the same given credit in both cases, is not justified on the basis of actual experience. Data which has been worked up following Mr. Steere's method used in Case I, given in Appendix I and III shows that the cost per M of gas made with a given coke credit for an oven gas fired plant are almost the same as the cost per M with a producer gas fired plant, if anything being slightly less for the producer gas plant. The next question then is that if there is no large difference, why be so concerned? The answer is that the similarity of costs is based on an equal coke credit in both cases, which as previously outlined, we do not feel is possible under usual conditions in the case of the oven gas fired plant which produces coke double in amount of the local domestic market to absorb and results in coke having to go into the open market and suffer the resultant punishment. A glance at Mr. Steere's table shows what happens to the cost of gas when the coke credit is affected.

6th—Further evidence that producer gas firing reduces gas costs and is to be expected is as follows:

(a) As a result of our experience we have detailed figures to show, which I will not here burden you with, from which we know that Producer Gas can be made including fixed charges and charging the full coke credit for the salable coke portion of producer fuel used, at a figure which when converted to a 540 BTU coal gas released basis equal to 17.8c per M. In other words, we know that including all costs producer gas can be made for 4.5c per M. This gas will release the oven gas otherwise required as fuel gas, and the gas so released as a result will therefore cost 17.8c per M. Therefore the additional coal gas capacity necessary to fire ovens with their own gas must be able to produce such gas

including its fixed charges at a figure less than 17.8c total cost in order to justify not using producer gas for underfiring.

Mr. Steere's paper shows that under most favorable conditions the fixed charges alone for coal gas amount to 13.1c per M and the total gas costs run well over any such figure as 17c per M. From these figures it is seen that the conditions are extremely rare that oven gas firing can compete with producer gas firing on a cost basis alone, and justifies the conclusion that firing with producer gas reduces rather than increases the cost. In addition, the oven gas fired plant produces coke double the amount of the high priced steady market to absorb, which further affects the coal gas costs. Bear in mind in this discussion we are approaching this problem from the point of view of the average gas undertaking. Obviously there are many conditions under which these conclusions may not be true.

(b) There is one other point which should here be mentioned, that even if the additional coal gas can be produced under 17.8c per M, such gas, rather than be burned as oven fuel, might better be sold at a rate justifying its higher form value. In other words, that gas might better be sold as an industrial fuel at any price above 17.8c in order to move it. It is fundamentally wrong to burn a high form value fuel like coal gas in competition with a low form value fuel like producer fuel. The only justification from a gas man's point of view for an oven gas fired plant, except in cases of expediency, is in a locality where there is a steady definite market for the excess coke so produced, and also where the excess gas produced by firing with producer gas cannot be moved at a price something in excess of 17.8 per M. Only under these rare conditions, at least from a gas man's point of view, is the oven gas fired plant justified.

(c) Another feature which is worthy of consideration is that if a gas plant aims to take advantage of the steady high priced domestic coke market it will find that a smaller sized coke is required, as a result considerable coke crushing will be necessary, which results in additional breeze production. In the case of the oven gas fired plant, such loss affects the amount of salable coke and thereby results in decreased coke credit which in turn causes increased gas cost. In the case of the producer gas fired plant such increased breeze production only goes to increase the per cent of breeze in the producer fuel, but does not in any way affect the amount of coke available for sale. A coke plant attempting to meet the domestic market is very apt to find it possessed of an excess of breeze and excess refuse fuel. The ability to utilize this refuse fuel as a means of releasing coal gas is self-evident.

It may be argued that a blue gas fired plant will accomplish the same features here claimed for producer gas. The point, however, that does not justify this contention is that blue gas uses salable portions of the coke produced which might better be sold. In other words, it has the same objection of the oven gas fired plant in that it uses as fuel a product whose form value enables it to be better sold. The producer gas fired plant leaves all its gas and the major portion of its salable coke to be sold and uses it refuse fuel for its own need.

(d) A producer gas fired plant within a few minutes can vary its gas production from 100% to 60% capacity without affecting oven heats and carbonizing speed. The flexibility of the producer gas fired oven is very desirable from the gas industry point of view and enables such a type of plant to be considered with a minimum of water gas capacity to meet peak loads, which in Case 3 of Mr. Steere's paper is responsible for the coal gas base load plant appearing to a disadvantage.

(e) A glance at the final table of Mr. Steere's paper will bring out another point which is fundamental in this consideration. In his set up of the coal gas plant fired by its oven gas, it is shown that a variation of $1.00 in the credit value of its coke affects the cost of gas approximately 10c per M throughout the entire range of prices shown. *In the case of the producer gas fired plant this variation is of the order of 3 to 4 cents per $1.00 variation in the coke credit. This shows how much the oven gas fired plant is at the mercy of its coke market, and in turn, because of its excess coke production, at the mercy of industrial conditions, which is most undesirable from the gas industry's point of view whose incomes are more or less fixed and unable to follow these ups and downs.*

The producer gas fired plant shows a variation which is only one third in amount but more important its coke is all disposed of locally to a stable domestic market and it is therefore not subject to the industrial variation in the value of coke.

(f) In the usual coal gas fired type of plant the coke breeze is used as boiler fuel, therefore it may be argued that the utilization of breeze in producers leaves no fuel for the boilers necessary for the plant. The answer to this seems to be that coal gas is very expensive boiler fuel, and further particularly that such steam might a great deal better and more economically be produced in a dry quencher, which conserves the heat of the outgoing coke which is otherwise wasted.

Conclusions

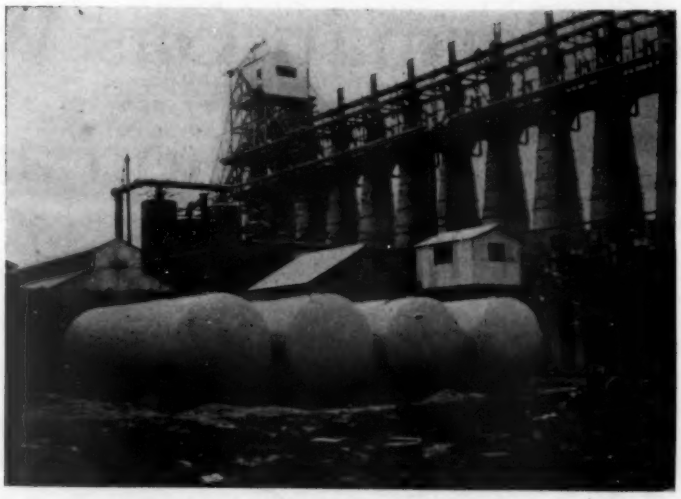
(1) From the above reasoning it is concluded that in the general application of the gas industry, if a coal gas plant is properly designed for the locality under consideration enabling it to take maximum advantage of the form value of its various products, the cheapest gas by far will be coal gas, and that in the future there is nothing indicating a cheaper form of gas, so that the gas industry can safely proceed on this premise.

(2) In order for a coal gas plant to take maximum credit for the form value of its products, except in rare instances, such a coal gas plant will be a producer gas fired plant, enabling all its gas and coke to be sold at a maximum price, and utilizes only the refuse fuel rather than using as fuel some of its own products of higher form value such as is the case when a coal gas plant is fired either by blue gas or oven gas.

These economics are brought about by the fact that in the average community the oven gas fired plant does not balance the gas and coke absorbing capacity of that community, whereas the coke and gas production of the producer gas fired plant balances exactly the average demand and results in both being absorbed at their maximum value. In other words, the policy of the industrial center in general is fundamentally wrong in the average gas utility consideration. This point is becoming especially true as a result of the increased number of carbonizing plants which dot our country. However, if each plant plans to confine itself to its own territory, it can reign supreme, protected entirely by its strategic position as a result of freight rates.

(*Continued on page 48*)

Low Temperature Plant of Welded Construction



The Bussey Coal Distribution Plant

THE new Bussey process plant near Glasgow, Scotland, has been assembled very largely by welding. This plant consists of fourteen internally heated vertical retorts and all the necessary accessory equipment for storage and handling of materials, by-product recovery, and gas handling. The retorts were designed to treat between 600 and 700 tons of Scottish coal per day, from which it was estimated that the output would be 20,000 gallons of liquid products, two million cubic feet of gas, and 450 tons of a "smokeless" fuel.

Retorts at the Bussey Plant

From the photographic illustrations, the general character of the retort structures can be seen. Each retort is built up of steel plate from three-eighths to one-half inch in thickness to a height of 30 feet and with a maximum diameter of thirteen feet. In the main body of the retort are four welded lap joints; the top and bottom hoppers, brackets, ladders, pipe fittings, etc., are also of welded assembly. The tanks, oil condensers, two washer coolers, eight decanter tanks each 4 by 8 by 30 feet, are of all-welded construction, with lap joints used for the greater part of the work.

The Bussey process, which is carried out in a firebrick-lined retort, takes place in three stages. In the first stage the incoming coal is heated up to about 300 degrees by the passage through it of the gases evolved in the lower part of the retort. During the second stage the temperature of the coal rises progressively from 300 degrees to 800 degrees F., the charge becoming plastic at a temperature characteristic of the particular coal being treated. During this stage a large part of the volatile matter is driven off from the coal with practically no secondary cracking of the hydrocarbons first evolved. In the third stage the heat necessary to carry on the process is generated by combustion of some of the solid semi-coke and the more volatile portions evolved therefrom at this higher temperature. Steam is introduced at this stage in order to control the temperature. All of the products of combustion in this portion of the operation pass upward together with the products of carbonization and that water gas which is evolved by action of the steam upon the hot semi-coke. Because of the mixture of the gases formed by this combustion with the gas generated by carbonization and water-gas reaction, the heating value of the resulting gas is much lower than that produced in externally heated retorts.

The plant at Glenboig, near Glasgow, is now being operated on an experimental basis at part capacity. No operating results can yet be reported from the project.

German Gas Works: Their Organization and Problems

G. HIRSCHFELD
German Technical Correspondent

RECENTLY the Association of German Gasworks, Inc., which represents one of the most powerful and best organized groups in the industrial and economic after-war development of Germany, celebrated its 25th birthday. This anniversary formed a memorable occurrence in the German gas industry and was given due expression through a large and impressive gathering of industrial, governmental, financial and commercial representatives at Cologne.

The evolution of this central organization is of particular interest to the American manufacturer because the problems which have confronted the German gas industry are of a similar nature to those found in the United States. It is for this reason that the organization and the problems referred to shall be discussed in a way which might give practical suggestions as to the solution of parallel problems in the United States.

The Association of German Gasworks was at the beginning of the century an organization covering the interests of some plants in the Western part of Germany and for which they disposed of the over-production of gas coke. At that time the efforts were mainly directed toward effecting the best possible sale, no matter whether the latter could be obtained near to or far away from the plant. It was not long before unlimited competition between the various gasworks or their associations, respectively, ensued. In spite of this, the production figures remained the same and the price was also kept at the same level. The consequence was the accumulation of a tremendous amount of stocks, so that finally the plants could not crowd in any more and were compelled to sell at the best obtainable price. Consequently, in 1902 and subsequent years the price declined from 160 marks or about 40 dollars down to 100 marks or about 25 dollars. Some transactions, which were closed with foreign customers were even based on a price of 80 marks or about 20 dollars.

This result of misguided organization and over-production led in 1904, to the foundation of a new and stronger organization which first cooperated with and later on absorbed the small organization, which had been formed some years before. This new association is the one which now looks back on 25 years crowded with activities and accomplishments. Its membership comprises more than 800 stockholders.

The first step taken by the new association to relieve the then existing situation of reckless competition was the creation of sales branches. These had the purpose of protecting as well as expanding the local market for each one of the member organizations. This measure had important results. Through the elimination of freight and transportation charges the gas coke could be sold cheaper and at a better profit; deliveries could be made quickly and competition was reduced to a minimum, inasmuch as each manufacturer was alloted its own local zone.

At first these sales branches handled only the quantities resulting from over-production, thus leaving the zone distribution to the manufacturers themselves. It was soon found out, however, that the market could best be exploited, if the distribution of the total production of coke was handled by these branches. This transfer was accordingly effected, the branch offices taking the risk of disposing of the total production at a profitable rate.

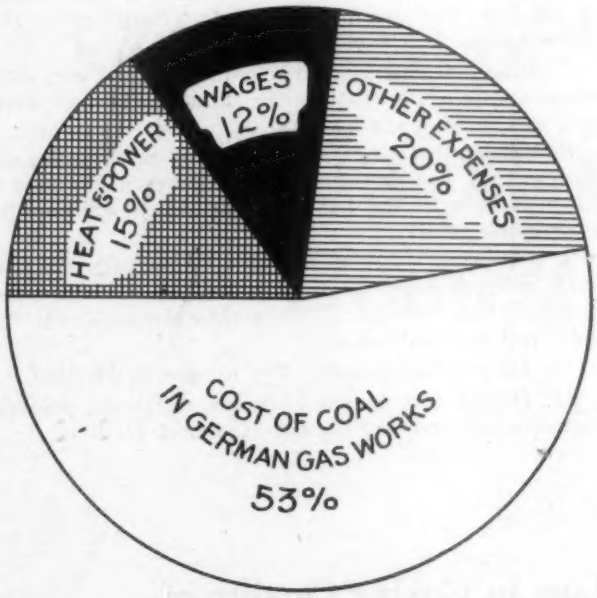
The advantage of such a concentration method was obvious. First of all, a price could be obtained in proportion to the corresponding assortment of the mine coke. Again, the possibility of selling gas coke right after its production without considering its storage or transportation to far-away places, where sales were possible, was another valuable factor obtained with the concentration of distribution in the branch offices. The final aim of the Association's work was to sell the total production of each manufacturer locally, this purpose having been fulfilled 100 per cent in some places, while

Cooperation in Coke Sales

Selling of coke is one of the big economic problems in any community where coal gas is made either in retorts or ovens. For twenty-five years an organization of German gas works has been studying this problem and developing the best available methods for maintaining stable coke markets. The history of that movement and its success is reviewed in the accompanying article by Mr. Hirschfeld.

American coke interests cannot use exactly the same procedure as is here described. Nevertheless it is well worth while to study the German methods and, by reading between the lines, to adapt for American application all legal and commercially feasible parts of the German scheme. The cooperative spirit which has lead to the successful German work is especially worthy of consideration by those who still believe that cut-throat competition in coke selling has any rightful place in America.

in others an increasing percentage in local sales was noticeable. Nothing, perhaps, could speak more convincingly of the full success of this concentration method than the fact that no notice of discontinuance of this distribution service has been issued up to the present.



German Gas Production Statistics

On the other hand, the income derived from the sale of gas coke on the part of the selling branches made it possible for the latter to reduce the taxes charged to the manufacturer for organization expenses by 20 per cent. At the beginning of the Association's work 25 years ago and for some time later, approximately 50 per cent of the total sales of gas coke was shipped to some nearer or further section, freight and transportation charges, of course, adding to the price of the product as well as lessening its competitive value. To-day 90 per cent of the saleable quantities of gas coke are disposed of in local zones, thus creating a better price, a higher income and reducing expenses to a considerable extent.

This is the result of the Association's work as far as coke is concerned; but its efforts have extended to other side products too, especially gas tar and ammonia. Since the beginning of 1925, the sale of the main products gained from manufactured gas tar, like pitch, oil, anthracene and naphthaline, has been organized. Contracts had been negotiated with tar manufacturing plants, which take about 85 per cent of the total production. The other 15 per cent is disposed of in the free market, but, as a matter of fact, the customers are about the same only that in the case of this 15 per cent the customers have to get, according to experience, a certain quantity in a hurry and are willing to pay higher prices. While this sales organization, as far as gas tar is concerned, comprised in its first years only 200 gas works, their number has in the meantime been increased to about 350, the annual production of which amounts to 184,000 tons. It can be asserted that 80 per cent of the tar is produced by gas works organized with the same principles in mind, so that the sales organization is pretty firmly established and will be able to successfully carry on.

Now, regarding ammonia. It is known that this side product used to be a vital factor in the calculation of the cost of manufacturing gas. Today it is almost unsaleable, either as liquid or concentrate. This declining demand is also noticeable in the reduction of the prices which are paid for ammonia in Germany. During recent years the price has declined from 80 and 90 pfennig (20 and 23 cents) to 35 and 40 pfennig (9 and 10 cents) per kilogram of NH_3. And there are no chances either that it is going to be more profitable to manufacture this product cheaper than was the case in the past.

The most interest, of course, centers in the production of ammonium sulphate. Here the hardest competition comes from the inventions and the scientific progress which has been made in general in the field of the synthesis of nitrogen. This new method of nitrogen production has brought the price down from 1.36 marks (32 cents) before the war, to 85 pfennig (20 cents) for today's annual average per kilo of nitrogen in ammonium sulphate. It can hence be seen that the price which the gasworks obtains per kilo of ammonia is very low and hardly justifies the great efforts that are being made on their part to make the production of ammonia really worth while.

Production value of By-products:

Gas-Tar	$12,000,000	in	1913	$46,000,000	in 1927
Bituminous Tar	$ 2,000,000	"	"	$ 3,600,000	" "
Benzol	$14,550,000	"	"	$42,550,000	" "
Sulphate of Ammonium	$53,600,000	"	"	$40,100,000	" "
Other By-products	$ 250,000	"	"	$ 500,000	" "

Attention is called to the fact that the German Marks are not converted into Dollars on the basis of the rate of exchange, but rather on the difference in the cost of living in the two countries, which is about 1 : 2. The latter proportion comes nearer to the actual value of the currency than the exchange rate; in other words, what you can buy in the United States for one dollar, will cost in Germany two marks, assuming that the dollars are earned in the United States and the marks in Germany.

Also, it must be taken into consideration that wages and most of the raw materials and factory management in general have increased materially since the war, as have interests, taxes and amortization. The only consolation for the gas manufacturer, as far as ammonia is concerned, is the fact that the world consumption of nitrogen has been tremendously stimulated through the lower cost of production which, in turn, is due to the synthetic process. Fortunately for the gas industry, the coke and gas works producing ammonia as a side line are not in competition with the manufacturers of synthetic nitrogen; on the contrary, both branches have a mutual sales organization thus avoiding all friction and the competitive drive, which is characteristic in cases where an old established industry and a powerful but new branch meet on common grounds. This cooperation once more must be credited to the Association whose activities are here under discussion. Still, the production of synthetic nitrogen is practically unlimited; it is so powerful and its chances are so tremendous that even the Chilean producers have been compelled to subordinate their interests to this young industrial branch. No wonder then that the Association of the German gasworks does everything in its power to maintain friendly relations with its influential competitor.

To turn once more to the tar market; the situation here encountered is rather difficult. There is a tremendous overproduction on the part of Germany as well as other European nations and, of course, the United States. In the last few years the coke plants have almost doubled their production. On the other hand, the actual consumption capacity of the market does not by any means keep pace with the present production figures. It is therefore the intention of the Association of the German Gasworks to stimulate interest among its consumers and to attempt to open new fields for the sale of tar oil. Aside from these measures, the contact with foreign countries is being stimulated, as well as negotiations with outsiders where such can be effected with mutual advantage. It is clear that without great efforts in domestic as well as foreign markets the situation cannot be either controlled or improved. The Association knows only too well that Germany herself has not sufficient consumption capacity for a satisfactory disposal of the tar oil manufactured in this country. This is one of the reasons why expenses for publicity campaigns and other advertising means are constantly increasing, with the idea of stimulating interest and enhancing sales of this important product.

Looking back at the activities of the Association of the German Gasworks carried on for 25 years it is safe to say that the great development would have been impossible but for the united and concentrated efforts of the Association on one side and of the different sales branches as well as of the sales organizations in general on the other.

Localization in the sales of gas coke according to the situation of the plants has resulted in considerable savings and higher profits. There are other factors which do not quite belong in the scope of this article, but which nevertheless also show the influence of concentrated efforts and fine cooperation among the various manufacturing interests, which once more tends to show the value of a central body not only for the furthering of manufacturing, but to no lesser degree for distribution methods.

A Recipe for the Individual Control of Accidents

1. Appreciate the seriousness of their threat and actually desire to prevent them. Out of this will come a sense of personal responsibility for their prevention.

2. Forget all about luck, or fate, or Providence as a possible dispenser of these unexpected mishaps. Accidents are man-made. Believe yourself the master of your own life and have faith in your ability to foresee its dangers and guard against them.

3. Do not consider yourself immune from accidents; realize that your past experience may mislead you. All persons are subject to accidents.

4. Understand that physical injury is not the accident, but is only one of the possible results of an accident. Appreciate that an accident which produces no injury may result, when repeated, in injury or even death. Prevent, if possible, the accidents, and the injuries will take care of themselves.

5. Each time you are brought close to an accident, or "near-accident," forget the question "who was responsible?"—it only clouds the issue. Don't look for "the cause." Try to discover all the causes—for there will be many. Go to the bottom of them. Don't be stopped by such vague generalities as "carelessness" or "human failure;" they are alibis—get down to the basic facts.

6. When you have done this, decide which one, or ones, you yourself could have removed, and which would have been the most effective. Forget what the other person might have done.

7. Make up your mind that nothing of the sort shall occur to you again—that, in the future and for all time, you will do what is necessary.

8. Realize that this course of action will require effort at first, but that out of it will eventually come a habit of thought and habits of life which will cost no appreciable effort.

9. Persevere. Learn something constructive from each of your own experiences and those of others. Adopt it into your life. The stakes are high—the results will be worth-while.

10. Do not fear danger. Try to meet it unafraid.

11. Do not fear to take a chance, weigh the possible consequences and then decide.—*Lewis A. DeBlois.*

Loss in Coking Quality of Coal Due to Exposure

As a general rule, coals initially high in oxygen absorb more oxygen readily, and if they initially possess coking qualities the coking strength is reduced upon exposure in storage. Such changes are particularly pronounced with high-oxygen coals which are near the border line between coking and non-coking coals.

The Northwest Experiment Station of the United States Bureau of Mines, Seattle, Washington, in cooperation with the University of Washington, has just completed and published the results of a study of the loss in agglutinating power of three coals of this character upon exposure. All three of the coals contained such high percentages of oxygen that they would not ordinarily be considered acceptable for the manufacture of blast-furnace coke, though all of them are being so used. Each coal was ground to pass 40-mesh size and exposed in a thin layer for several months in the laboratory. Coal of this rank is so susceptible to deterioration in coking quality that it is possible to follow the loss in agglutinating power at ordinary temperatures in comparatively short periods of time, whereas with the higher rank Eastern coking coals it is necessary to use elevated temperatures to accelerate the deterioration. The loss in coking property was determined at intervals by means of the Marshall-Bird agglutinating test.

Two of the coals showed a drop in agglutinating value from approximately 3500 to 850 during the first two months. After this period the loss in agglutinating value was at a much slower rate. The other coal, which had an agglutinating value of 3700 originally, dropped to 2800 in one month and to 2500 in two months. Ultimate and proximate analyses were made of each coal before and after the test period. The most significant change noted was the increase in oxygen content after exposure.

Comparing the Resistance to Corrosion of Materials Used as Linings in Gas-Fired Domestic Ranges

OTTO LUTHERER
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E. R. WEAVER
Chemist, Bureau of Standards.

Note: A more complete paper on this subject will be written for the Journal of Research when the results are complete enough to justify one.

I—INTRODUCTION

THIS paper is a preliminary account of the development of a method for the investigation of the relative resistance of metal oven-lining materials to corrosion. The investigation was proposed by the American Gas Association and conducted at the Bureau of Standards. Its primary purpose was to develop a reasonably rapid method by which the ability of a material to withstand corrosion under the conditions of service existing in domestic gas ranges could be determined. Such a method is needed both to enable the manufacturers of appliances to select the materials most suitable for their use, and to enable the American Gas Association to determine the merits of appliances, in which the materials are used, in connection with the granting of formal approvals.

The linings of ovens and burner boxes are subject to severe conditions which cause them to corrode, with the result that they become unsightly and may be perforated and weakened to the extent of becoming unsafe before other parts of a well constructed range begin to show signs of failure.

To be useful, a method of test must result in assigning to various materials as nearly as may be the same rotative ratings with respect to resistance to corrosion as would be assigned by observing the material in average service for a number of years. It is not feasible to judge this rating from an actual service test, both because of the time required and because no two ovens in service are subjected to exactly the same series of changes. On the other hand there is valid reason for objecting to a method of accelerated testing which depends upon the effects of conditions of a different character than those usually encountered in service, for example, exposure to a chemical reagent not ordinarily placed in ovens.

The method of testing here described was devised for the purpose of applying the usual causes of corrosion in such a way that their action will be much accelerated, but without subjecting the specimens to any destructive agency not normally encountered in service. Since service conditions can not be reproduced exactly in an accelerated test, it was agreed in advance that no method could be regarded as satisfactory which would ascribe to the specimens relative merits obviously at variance with experience.

II—OVEN LININGS IN USE

The first step in the investigation was, therefore, to write to every manufacturer of a gas range which has received the approval of the American Gas Association, and to a number of the larger gas companies, stating the purpose of the investigation and requesting all available information regarding the life of oven lining materials in service. Replies were received from nearly every one addressed and were surprisingly concordant.

Nearly all manufacturers are now using or have used in the past both vitreous enamels and all-metal linings. Everyone agreed that a good coating of enamel is a perfect protection from corrosion. However, much difficulty is encountered in completely enameling and assembling all the parts which go into an oven without some warping or chipping; and the danger that the enamel will crack or chip during service, exposing the metal to corrosion and possibly falling into food, is well recognized. For these reasons, only a small minority of the manufacturers appear to be really satisfied with enameled linings. They present a totally different prob-

Publication approved by Director, U. S. Bureau of Standards.

lem than do the all-metal linings and will not be further discussed in this paper.

Of the all-metal linings, the high-chromium "stainless" steels or "rustless irons" were considered satisfactory except for the high cost of material and fabrication. The same appears to be true of the copper-nickel alloy "Monel metal," but only a few manufacturers have had experience with this material. Leaving out of consideration the enameled coatings, an overwhelming majority of the linings used are of iron or steel protected by a coating of another metal usually applied by hot dipping, followed by a heat treatment, but sometimes applied by electrolysis. A few have been coated with finely divided metal, usually aluminum in a "baking enamel" or other paint "vehicle." Some others have been given an adherent coating of magnetic oxide by a special heat treatment.

With few exceptions the protective coatings, other than vitreous enamel, are not applied by the range manufacturers; but finished sheets of "oven lining stock" are purchased, and only the cutting and bending are done where the range is made. The oven lining stocks are usually purchased under trade names and not under specification, and it is not certain that the same trade name has always represented identical material. Nevertheless there is good agreement among the manufacturers regarding the relative merits of the various linings and the character of the faults which appear in service. Samples of all the oven lining stocks known to be in commercial use were secured for this investigation, in addition to several specially prepared ones. It is perhaps the best indication of the merit of the testing method to be described that its results coincide almost perfectly with the concensus of opinion of range manufacturers and gas companies regarding the relative lasting qualities of the commonly used materials, and the character of the defects which develop in service in each case.

III—CAUSES OF CORROSION OF LININGS

Corrosion in the oven may be regarded as the resultant of three different probable actions: (1) direct oxidation by air caused by high temperatures; (2) attack at high temperatures by substances other than oxygen, particularly by small amounts of sulphur compounds; and (3) electrochemical corrosion, which can take place only when there is at least a trace of liquid film on the surface. The liquid may come from water formed during combustion, from steam produced while foods are being cooked in the oven, from liquid spilled in the oven or introduced during cleaning, or from moisture condensed from the air when the relative humidity of the atmosphere is very high. An oven can hardly be kept entirely free from hygroscopic materials. There is more or less spray from boiling liquids, which may contain salt and many other things, and there is always the possibility of the condensation of a little sulphuric acid from the gas burned. Ordinary salt, to say nothing of the compounds produced by reaction with sulphuric acid, will take up water at relative humidities which are reached at times in all parts of the United States, and practically every oven in which iron is exposed will show some corrosion (ordinary rusting) of a type which is well recognized as electrochemical.

Some metals when oxidized at high temperature form oxide films which are very adherent and serve to protect the metal beneath. To some extent the products of electrochemical corrosion similarly protect the metal against further corrosion. Rapid changes of temperature are likely to disturb a protective film of either type, hence the changes of temperature which take place in an oven may cause electrochemical corrosion to proceed further and more rapidly than it would at any constant temperature.

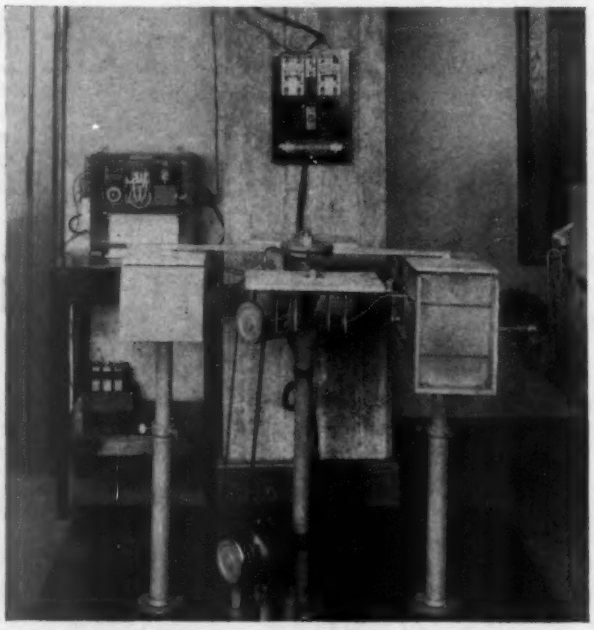


Fig. 1—Showing Test Machine at Rest

In order to reproduce the factors which cause corrosion in service we should, therefore, provide for at least three conditions which always occur to some extent in service: (1) exposure to temperatures equal to the maximum likely to be reached in service; (2) rapid changes of temperature corresponding to those which take place when an oven door is opened and a cold article inserted; and (3) subjection to a film of moisture.

IV—DESCRIPTION OF THE TESTING APPARATUS

A machine was built which subjects the specimen under test to an automatically repeated cycle of this kind. The essential parts of the device are a gas-fired furnace, a steam bath and a mechanism to render the whole action automatic. A shaft inserted in a tube carries arms supporting four lids and is raised and turned a quarter of a revolution by means of a motor, proper reduction gears and a cam, whenever the desired furnace temperature is reached. The mechanism is actuated through relays closed by contacts in an electric temperature recorder. The lids carry the samples, which pass successively through the following stages: (1) heating the samples and exposing them to flue gases until a definite temperature is reached; (2) cooling them in the open air; (3) enveloping them in a cloud of steam; (4) drying them in air. The temperature in the furnace at the bottom of the specimen is kept at 295°C (563°F) and at the top at 265°C (509°F), corresponding to about the highest temperature ordinarily employed in the ovens of ranges. The time of exposure to each of the four conditions during one cycle is usually from 12 to 15 minutes.

It was at first thought that the use of weak acid solutions would be necessary in stage (3) for the purpose of accelerating corrosion, but the first tests which were made by dipping the samples in water disclosed the fact that the action was sufficiently rapid without adding anything to the water. The corrosion was not uniform over the surface of the specimen. A trial run, employing steam at atmospheric pressure, gave nearly as rapid results and seemed to reproduce actual service conditions even better than the water bath.

Samples 4 inches square were obtained from manufacturers of ranges and from steel mills, and were hung from the four lids of the machine. From the beginning, it was found that the materials behaved very much as the correspondence from the manufacturers indicated, and that with the exception of a few (mainly stainless steels) corrosion started very soon.

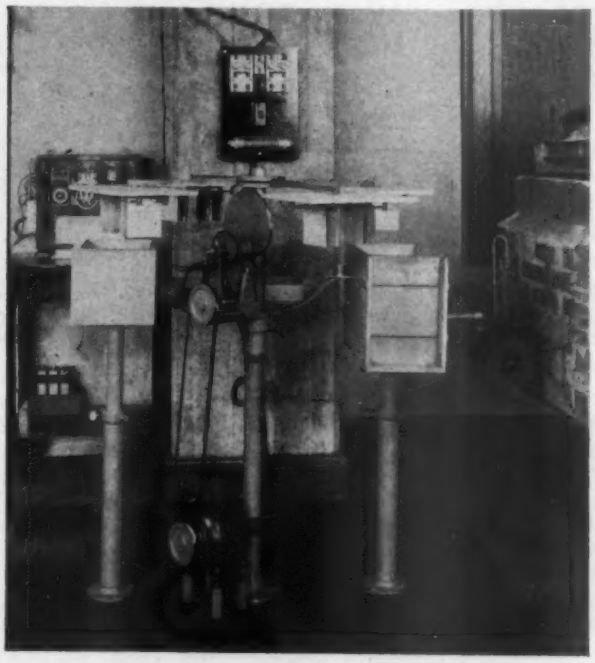


Fig. 2—Showing Position of Mechanism During Rotation

Figure 1 shows the machine at rest with test samples in the gas-heated oven (on the right) and the steam bath (on the left). When the temperature of a thermocouple in the oven reaches 550°F, the recorder in the background closes a contact and the mechanism raises the lids with samples attached, rotates them through 90° and lowers them into position. Figure 2 shows a position of the mechanism during rotation.

V—RESULTS OF TESTS AND FUTURE WORK

It would be premature to describe the behavior of various materials. The tests have shown that all except the most resistant show marked corrosion during 200 cycles, and some which are employed commercially distinctly show deterioration after five cycles. A large number of materials have been subjected to 200 cycles, with results which were generally consistent among themselves and in good agreement with the results of experience as these were reported by manufacturers of ranges and by various other observers.

Substantially all of the tests have thus far been made upon flat sheets and have given little indication of the effect of bending or other working during fabrication. Bending may be of great importance, particularly in the case of coated metals. Recently a series of tests has been started with samples having bent edges which, it is hoped, will be of much assistance in judging the practicability of using many of the materials which show superior resistance to corrosion when flat.

VI—ACKNOWLEDGMENTS

The development of the method described, the actual testing of materials, and the interpretation of results have been shared by a number of members of the Bureau's staff among whom credit is particularly due to H. C. Bailey, W. Criswell, J. H. Eiseman, C. M. Saeger, and F. A. Smith. The cooperation of manufacturers, both of sheet metals and of appliances, has been generous and indispensable.

VII—SUMMARY

An apparatus is described by the use of which samples of sheet metal can be subjected automatically to a continuous cycle of alternate exposure to heating in a gas-fired oven, and to condensed moisture. These conditions are intended to reproduce the causes of corrosion in the ovens of gas ranges, and lead to very rapid corrosion of many of the materials used for such service. Results are consistent among themselves and in accord with general experience. The comparison of the various materials tested is reserved for a later paper.

Refrigerators Modernize Old Dwellings

THE installation of automatic refrigerators in many of New York's apartment houses that were erected from five to ten or more years ago is enabling these buildings to compete with the more recently completed dwellings, according to N. T. Sellman, director of sales and utilization for the Consolidated Gas Company of New York.

While the modernizing of individual dwellings usually involves extensive remodeling, that of apartment houses is a much simpler matter, since the installation of automatic refrigerators is often the only necessary addition, Mr. Sellman says.

"People looking for new apartments this spring are insisting on automatic refrigeration," he states. "This is shown by the fact that sales of automatic refrigerators for installation in other than new apartment houses are mounting rapidly. In 1929 orders for about 11,000 automatic gas refrigerators were received by us for this type of building, or slightly more than fifty per cent of the gas refrigerators sold during the year.

"A further increase in this business is anticipated for 1930, when it is expected that at least 18,000 gas refrigerators will be installed in other than new apartments in the gas company's territory."

During the month of February, 1930, 2310 gas refrigerators were sold by the company, of which 1055, or 45%, were for the older apartment houses. This compares with 490 refrigerators sold in the same month in 1929.

Fig. 1—Testing a Manhole for Gas

Explosive Gas Detector

Recently Developed Instrument Provides Simple Means for Investigating Gaseous Atmospheres

W. B. ROWLAND

Manager, Safety Appliance Department, Union Carbide Sales Company, New York

AN instrument that detects immediately the presence and concentration of a wide range of combustible gases and vapors, has been recently placed on the market by the Union Carbide Sales Company, of New York. Engineers of the Union Carbide and Carbon Research Laboratories, Inc., first developed a methane-indicating detector for the detection of methane, or firedamp, in coal mines. This device successfully passed the rigid tests of the United States Bureau of Mines and received its approval as permissible equipment for use in methane and air mixtures. During the development research it was discovered that the methane-indicating detector, with slight changes, was also suitable for the detection of many other combustible gases and vapors. There was accordingly produced the U. C. C. Combustible Gas Indicator, which is identical with the methane detector in construction, except for certain modifications to make the instrument better adapted to the detection of numerous combustible gases encountered in many industrial fields.

The instrument makes use of a heated metallic filament connected in one arm of a Wheatstone bridge circuit. Its operation is based upon the fact that the burning of a combustible gas on the surface of a heated filament causes an increase in the temperature of the filament and consequently an increase in its resistance. If, when the bridge is in balance, the filament is exposed to a combustible gas-air mixture, the resultant combustion throws the bridge circuit out of balance and current flows through the galvanometer, causing a deflection of the needle. The magnitude of this deflection is dependent upon the concentration of the combustible component of the gaseous mixture.

As shown, the Indicator comprises the following parts: Detector head or combustion chamber, meter case, and portable storage battery. These three parts are assembled in a convenient carrying case, connected by flexible cable. The detector head consists of a cylindrical metal case, or bonnet, which screws onto a metal base equipped with a short carrying handle. The bonnet is provided with louvres, or small openings, which permit the circulation of the atmosphere being tested about the heated filament. Within the bonnet are three concentric gauze screens, of a type similar to those used in flame safety lamps, which prevent the ignition of an external gas and air mixture. In the center of the chamber formed by these screens is the filament cartridge. The detector head is so constructed that accidental incorrect assembly of safety screens and filament cartridge renders the circuit inoperative.

In use the detector head is placed in the atmosphere to be investigated and a quantitative determination of a known combustible gas is obtained by comparing the reading of the meter scale with a curve chart supplied with the instrument. For determining the hazard of unknown mixtures of flammable gases, the meter reading is referred to a "percent of explosibility" curve. Especially for use in the petroleum industry, the meter scale is divided into a white and a red section. If the meter needle comes to rest in the red section, an unsafe condition is indicated.

Sampling and laboratory analysis are eliminated; indications are immediate. Explosive mixtures of gas and air are vividly indicated by repeated oscillations of the meter needle. Guess work is eliminated, as readings

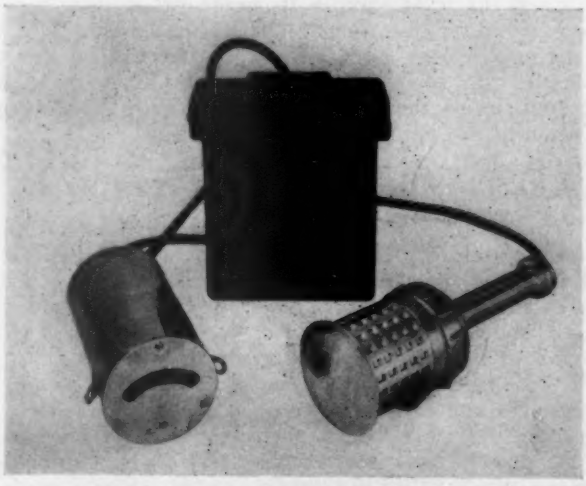


Fig. 2—Component Parts of Indicator

Fig. 3—Parts of Detector Head Assembly

are direct and accurate. Frequent observations may be made while men are working in gaseous atmospheres and all parts of tanks or compartments can be tested for gas pockets. The detector head may be lowered into a tank while the operator remains outside. The apparatus is entirely self-contained and not dependent on any non-portable source of power. Since the platinum filament does not operate catalytically, it is not subject to the deleterious effects of sulphur compounds.

The U. C. C. Combustible Gas Indicator has been found to operate satisfactorily and safely in explosive mixtures of many gases and vapors to which it is applicable. It serves not only for determining their presence in the air but also for reading their percentages accurately up to the lower explosive limit. The entire outfit is safe to operate in gas-air mixtures, even those of most explosive proportions.

This device is useful in the gas industry for tracing leaks in gas manufacturing plants and in pipe lines. In the case of underground services, the bar hole method is employed, test holes being made above the pipe and followed to the point where the instrument indicates the greatest concentration of gas. This instrument has proved to be very convenient for the testing of manholes. It is also of great value for investigating the atmosphere about a gas plant or pipe line to determine whether or not the atmosphere is safe for flames or fire. Thus a simple means is furnished for determining whether or not hot repair work can safely be done or flame or spark-emitting devices used.

Gas Company Successfully Meets Unusual Emergency

A WELL planned program enabled the Malden & Melrose Gas Light Company (a Tenney Service Company) to promptly handle a complete failure of the gas supply in the Town of Reading, occasioned by a heavy explosion.

State highway reconstruction was in progress between Reading and Stoneham. Contractors, working for the State, were engaged in blasting out ledges along the State road. This main road contained the high pressure gas line supplying the Town of Reading. Anticipating the possibilities of trouble during the period of reconstruction, an observer had been carefully following the progress of work on the State road and checking results after each explosion.

The explosion, which resulted in the crushing of the gas line, was set off at 10:10 Saturday morning. Immediately thereafter, on noticing the odor of escaping gas, the observer called in main gangs working in both Reading and Stoneham and the work of clearing the site was commenced.

At about the same moment the observer started rounding up emergency crews, the Reading branch office was notified by consumers of increasing low pressure and found on investigation that high pressure was still being sent out from Stoneham. The main office at Malden was immediately advised that a bad break existed between Stoneham and Reading. Emergency measures at once became effective throughout the system.

All available appliance experts were ordered to report at Reading as fast as they were located and in a comparatively short time all departmental heads were in touch with the situation.

In the meantime it was discovered that several lengths of the gas main had been crushed owing to the whole mass of the ledge being thrown toward the center of the street by the force of the explosion. Pressure on the main was shut off at 1:30 and the work of replacing the gas line proceeded with speed and efficiency.

It was necessary to get in touch with every one of the sixteen hundred customers, request them to shut off all burners and appliances using gas and advise them that a man would call later when service was resumed to be sure that normal conditions again existed. This tremendous task required the services of an emergency organization which was difficult to secure on a Saturday afternoon.

At 1.30 the work of assembling a skeleton organization started. By 2.15 a crew of twenty-five were on hand in the main office. The group were at once divided and set at work.

One division, using the meter readers' books, provided the street addresses of customers and telephone numbers, if available. The other crew called up the customers and advised them of the exact situation.

By 3:15 another crew had been assembled at Reading including meter readers and appliance experts. This crew at once called at the houses of all who did not have phone or did not respond to calls. In a very short time every customer had either received a phone call or personal visit and had been advised of existing conditions.

At 5:50 service was again resumed at full pressure.

Between six and nine in the evening a personal call was made on every customer and conditions in each home carefully checked up.

The emergency program worked smoothly from start to finish and gave great satisfaction to the customers.

An appreciation of the service rendered appeared in the form of an editorial in the Reading Chronicle of March 28.

In the era of mergers and consolidations through which we are passing, the accountant's place is indispensable. Upon the accuracy and integrity of his work depends the safety of vast aggregations of capital, owned by millions of investors and supporting an army of employees. Great industries rely upon the data he furnishes, not only to tell them the results of past operations but to guide them in their future policies.—*Geo. B. Cortelyou.*

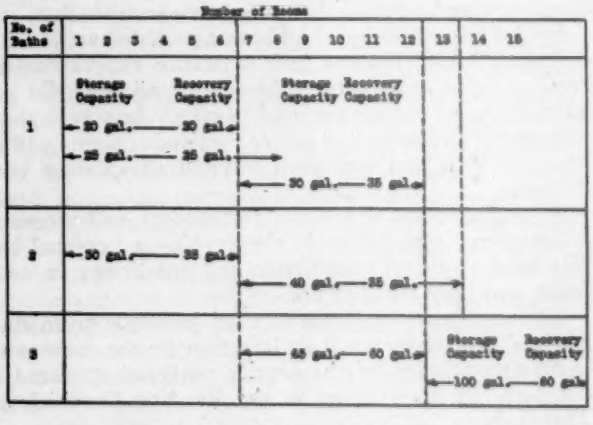
IX-Water Heater Accessories

AS a fairly definite rule, the selection of heaters (eliminating the circulating tank heaters bought on price considerations), can be governed by the use. The tank water heater has its advantages and has done much to sell gas as a water heating fuel to the public. But its service is not to be compared to an automatic supply. With a tank heater, you must wait until it is ready to give it to you.

For an installation using water only for dish washing the two range non-automatic heater is ample. For the normal household, the self action heater is the best adapted. When a concentrated heavy load is encountered with long idle periods between, the instantaneous heater is the best. There will always be border line requirements for which good analysis and application of the principles enumerated will give the correct type.

The size of the heater installed in relation to the hot water needs always has an important bearing on the operating cost. The diagram given below has been found to give adequate service for practically all cases. This diagram can be made of immediate sales value by inserting the trade names and size numbers corresponding to the sizes recommended.

RECOMMENDED SIZES OF SELF-ACTION HEATERS



For larger homes built up multiple units or indirect cast iron steam boiler systems should be used.

This diagram is based on the quantities of hot water recommended in the A.G.A. treatises on water heating, or from similar authoritative data. For conservative, rapid estimates the system must provide for at least two consecutive baths of 20 gals. each where one bathroom is in the house and one additional bath for each extra bathroom. It is unnecessary for the tank alone to provide the water supply, but the combined storage capacity and recovery capacity of the heater should be large enough to carry the load.

The self-action heater should be equipped with a number of necessary accessories. These are a thermostat, a thermostatic safety pilot, a pressure and temperature relief or shut-off valve and a drain cock. A draft hood is, of course, standard equipment on all appliances except incinerators.

The Thermostat

The thermostat is a device actuated by temperature changes, the function of which is to control the temperature. For maintaining the temperature of the stored water within fixed limits various types of thermostatic controls are employed. The governing movement of all is either a bi-metallic element or a confined volatile liquid which expands upon being heated. The difference in operation of the three types; the snap acting, quick acting and gradual acting thermostats, is in their manner of opening and closing the gas valve. The snap-acting control throws the valve with a snap, the quick acting throws the valve quickly but not with a snap, the gradual acting, or throttling, operates similar to the oven heat control of a gas range.

The thermostatic element itself is similar to those used on the gas range. The mechanism for converting changes in the temperature into moving gas valves, however, is quite different.

Snap acting thermostats are equipped with a series of multiplying levers, springs and dead centers to snap the valve over. The valve remains open while expansion is gradually taking place until the lever reaches dead center and the water temperature has reached the desired setting. The slightest increase in the expansion thereafter, causes the valve to snap onto the seat and close.

Quick acting thermostats usually employ a gradual acting thermostat in conjunction with a diaphragm valve. Equalizing the pressure on both sides of the diaphragm causes the valve to close by dropping on its seat and by bleeding gas from the top of the diaphragm the valve quickly opens.

Gradual acting thermostats open and close gradually in direct proportion to the temperature of the water surrounding the element projecting into the tank. One of the expanding elements is attached directly to the gas valve. This type of valve should be used only with a burner that is flexible over an extremely wide range in the gas rate.

The current practice is to employ a by-pass supply to the main burner to take care of the standby loss of the heater in which case the thermostat shuts off when the desired temperature is reached which is maintained by the gas passing thru the by-pass valve.

Any of these types of thermostats are satisfactory as they maintain water temperatures within very close ranges, the extreme variation permitted being only 25°.

Thermostatic Safety Pilot

Since the heater is automatic and depends on the continuous pilot flame to light the main gas supply when the thermostat opens and allows gas to pass, it is essential that some means be provided to automatically close this supply should the pilot flame be extinguished. A pilot flame may go out from many reasons. For instance, an excessive draft down the chimney; an inexperienced person seeing the pilot flame burning may shut off the cock; the failure to relight the pilot when making alterations on some other appliance on the same gas line, clogging up of the pilot ports, and others occur.

The principle of operation of safety pilots is practically similar to that of thermostats, except that they are actuated by the heat from the main pilot flame or by the heat from an auxiliary pilot that is ignited by the main pilot flame.

Although the American Gas Association approval requirements for water heaters give distinct requirements for the allowable time for the thermostatic pilot to open and close, the progress in the design and manufacture of these accessories has increased to a point where thermostatic pilots function within 2 minutes. The A.G.A. Approval requires that the device shall not require more than ten minutes for setting after the pilot flame is lighted, and that the device shall close the gas supply in not more than ten minutes after all gas is shut off, when the main burners have been operating at their normal rating for 15 minutes.

The safety pilot is located between the thermostat and main burner. The body of the device is usually located on the outside of the jacket with the expanding elements projecting into the combustion chamber. Occasionally, the entire valve is located in the combustion chamber. Its location with respect to the main burner should, however, be such that the bi-metallic elements are not over-heated as they may lose their sensitivity by excessive heat.

Safety Pilots are constructed in various ways. Some are manually started by pushing in a plunger, but are automatically closed. Others are entirely automatic. Of these, the majority function only when the pilot flame is extinguished or ignited. In this type then the valve remains dormant over a considerable period of time and unless properly constructed the valve may not respond when called upon. Another type functions whenever the control that turns on the main gas supply operates. This employs an auxiliary pilot. The advantages of the latter type are that the elements should have longer life since they are not continually heated by the pilot flame and the question of functioning at the proper time due to remaining idle for a long period of time does not exist.

Relief and Shut-Off Valves

Should the thermostat fail to shut off the gas flow when the temperature setting is reached, the contents of the system would continue to increase in temperature and could overheat to a point where a slight reduction in pressure will cause the water to flash into steam. The results of this change of state are often mistakenly set down as gas explosions. To prevent excess pressure or temperature development, relief valves which dissipate these excesses or shut off valve which shut off the gas preventing further generation of heat should be always used.

Pressure relief valves are of the spring, diaphragm or dead weight type. Because of its large seating area the diaphragm type is considered most reliable as the tendency to bind the valve is less and sticking of the valve is rapidly overcome because only a slight increase in water or steam pressure will overcome it. All valves should be constructed of non-corrosive materials and it is desirable to have the setting adjustable, so they may be adjusted when installed to relieve at a pressure of about 10 lbs. above the maximum daily pressure in the system. Adjustable valves must have some method of locking and concealing the adjustment. If the valve has a fixed setting, the relieving pressure should be stamped on the valve.

Pressure relief valves are invariably located on the cold water inlet in the hot water supply to the storage tank from the heater or in the drain line leading from the tank. The first is the most desirable location as there is less chance for the valve sticking because of sediment or corrosion. Where the pressure relief valve is combined with the drain valve its location in the drain line will give satisfactory service if the drain valve is occasionally flushed. It is necessary that the relief valve be located between the tank and the nearest shut-off valve.

Action of Relief Valve

Various types of temperature relief valves are manufactured. The relieving of the valve depends either upon a fusible metal that melts at a definite temperature or upon a bellows containing a volatile liquid. The method of relieving is done in one of two ways, opening the system to the atmosphere or closing off the gas supply. The bellows type will automatically reclose the system or reopen the gas when the proper operating conditions again exist. The fusible type cannot be put back into operation without replacing the metal.

Temperature relief valves set below 212° F. are intended to prevent steaming water from resulting at the fixtures. It should be remembered, however, that a temperature relief valve will not relieve a closed system of excessive water pressure resulting from the expansion of the storage water under normal temperatures. Therefore, a pressure relief valve is always necessary in a closed system. Usually, temperature relief when used is incorporated in the pressure relief valve.

The proper location for a temperature relief valve is on the hot water outlet connection of the storage tank with the fusible metal immersed in the tank or located close thereto. Fusible metal made by a reliable manufacturer will melt within a few degrees of the temperature marked on it. But the temperature of the water in the tank may be far above the melting temperature of the metal if the valve is not properly located on the system.

Where a combination temperature and pressure relief valve is used it is advisable to give preference to the pressure relief and locate the valve in the cold water line.

As an automatic storage water heater is frequently employed to serve as a storage tank for an indirect heater or water back attached to a coal furnace, a temperature relief valve improperly located may blow because of overheating of the water by the coal furnace on a cold day.

The drain connection from a relief valve must be connected to a suitable sewer connection. When a relief valve lets go, water leaves the tank. If a drain is provided, the water passes off. With excess temperature it is possible (with the valve on the cold water

inlet) to relieve only cold water and have the water in the storage tank completely evaporate.

The temperature shut off valve has the same purpose of preventing excessive water temperatures, but operates on a different principle and with results tending toward greater safety. If an excessive temperature is reached, the shut off valve functions to remove the cause of the high temperature by stopping the gas supply. The only indication of a misadjustment in the heater is the lack of hot water.

The Drain Valve

The function of a drain cock is to flush the system and free it from dirt, sludge or precipitated mineral matter. In hard water sections this is very necessary, for not only does the built up scale greatly increase the heat requirements but the chemical make-up brings about pitting and corrosion of the coils. Proper and periodic draining will eliminate the sludge and greatly increase the life of the heater.

The Chapter on Appliance Installation will serve to give the basic principles for setting water heaters. The properly installed system (non-automatic as well as automatic) must be flue connected, and have a shut-off or relief valve. When a relief valve is used, the drain must be solidly connected to a sewer drain. Water heaters should never be located in bath rooms as corrosion of burners and casing can interfere with combustion. When it is necessary that small closets or bathrooms be used to house the water heater, openings in the top and bottom of a door must be large enough to always give a good air circulation.

House piping should be covered with a good grade of medium temperature insulation. Return circulating water lines should be avoided as an extravagance. The extra convenience of immediate hot water because of a return circulating system tends toward high bills because of the constant heat loss from the circulating lines which, as can be seen from the previous table, is considerable in amount.

The benefits of gas service for hot water supply are many. The cleanliness of the fuel, the ease of control, the safety of operation and dependability of the supply are without equal from any other source of heat.

(The next article treats with Central House Heating.)

Comments on "Theoretically Correct Gas Plant"

(Continued from page 36)

(3) A producer gas fired plant further has flexibility of operation which is most desirable from the gas industry point of view and enables coal gas to assume a larger share of base load which further improves its economics.

(4) Coal gas as compared with water gas, in addition to the above points, has a further advantage in that its lower specific gravity will increase the capacity of a given distribution system, which in many cases with our pyramiding gas load is becoming a vital factor.

(5) We should therefore have courage to proceed along these lines in order to further the development of the American gas industry.

(To be concluded in June issue)

Increasing Production of Carbon Black From Natural Gas

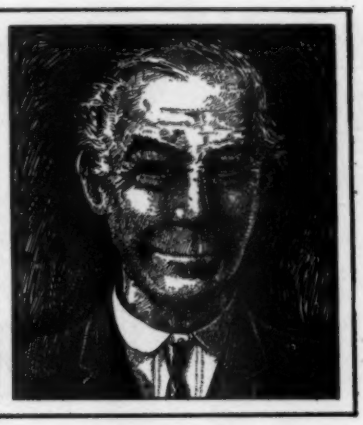
LARGELY increased yields of carbon black from natural gas have been obtained by injecting the gas into a bed of ignited coke in the course of tests recently conducted by the United States Bureau of Mines, Department of Commerce, with the Louisville Gas & Electric Company, at Louisville, Kentucky. For many years the better grades of carbon black have been produced by burning hydrocarbon gas incompletely, natural gas in particular, collecting the free carbon evolved by depositing it upon relatively cool metal surfaces, and also by filtering the gaseous products of combustion through cloth. As a rule, the yield of carbon by this process is less than 1.6 pounds per 1,000 cubic feet of gas treated, whereas it is known that the actual total carbon content of the natural gas averages about 30 to 36 pounds (varying with the composition) per 1,000 cubic feet. Because of the low percentage of the total carbon in the gas extracted by this method, attempts have been made by different investigators to treat natural gas so that a higher yield of carbon would be obtained. Experiments of this nature have not been entirely unsuccessful. It has been found possible to obtain yields of carbon approximately 10 pounds per 1,000 cubic feet of natural gas used, but the carbon thus produced has not graded as highly, for most uses, as that made by the older process. The methods used in obtaining the increased yield consist in causing the natural gas to pass through a chamber containing highly heated solids and to contact the surfaces of the solids. The heating of the solids and the gas-cracking operations are alternated.

In providing the solids, refractory materials are commonly thought of and they have been used. It seems that up to a recent date few attempts have been made to produce carbon black by injecting natural gas into a bed of incandescent solid fuel (coke). In the tests conducted by the Bureau of Mines at Louisville, a standard water-gas generator 9 feet in diameter was used; the operation consisted essentially in first heating the bed of ignited coke by air-blasting, discontinuing this, and then introducing natural gas; the cracked gas with the entrained carbon was removed through the regular gas offtakes. The cycle was repeated regularly. The yield of carbon was approximately 7 pounds per 1,000 cubic feet of natural gas passed. The quality of the carbon was not equal to the best, but it is believed to be such that it will find use at a fair price in certain industries. Further tests will more definitely establish its value relative to carbons made by other processes.

It is interesting to note that in this process not only can carbon black be recovered, but also a gas containing a high percentage of hydrogen. The hydrogen, in certain localities where natural gas is available, may find use as one of the raw materials in the synthesis of motor fuel, methanol, ammonia or other materials.

A Report of Investigations more completely describing the experiments has just been issued by the Bureau of Mines.

Letters from a Gas House Terrier to His Grandson



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Dear Sam:

Back in the town where I was raised, old Colonel Tapperton used to set out in front of the bank he owned and let the passin' public in on the secret of what he had had for breakfast the last few mornin's. The record was right there on the front of his vest, for all that run to read. The Colonel's theory was that he was too rich to <u>have</u> to have his vest cleaned.

An' I've noticed here lately in goin' about that the same type of notion is liable to creep into a gas company if it ain't watched. For, Sam, it looks like there's just two kinds of corporations that think they can't afford to keep up their property right durin' a hard year: them that's too rich an' them that's too poor.

While, for plain devastation, they ain't nothin' can beat an economy wave when it once starts rippin' an' roarin' its way through a public service outfit.

The "Save the pennies an' you'll save all" wave will start, say, with the president's wife happenin' to buy somethin' extra doggy in the opery-cloak line, just about the time a bunch of stocks that he don't own anyway starts to-bogganin' downward. At which he preaches economy to her so hard that he bawls out his secretary next mornin' for not savin' the envelopes the mornin' mail come in to use as scratch-paper; from sheer force of habit.

The vice president overhears him, an' fires two clerks, just to show he's in sympathy with the chief's new policies an' in line for his job.

With the roar of a' avalanche the wave then sweeps through the purchasin' department.....An' I don't need to tell you what happens when <u>that</u> department begins runnin' its finger down the right-hand column of the bill of fare!

By that time the operatin' boys is bein' flattened beneath its fearful force. And at the first gusts of the oncomin' storm, a requisition all made out for paintin' a gas holder that's already overdue for protection is hurriedly burned, the ashes concealed in a suitcase weighted with stones, and the case with its ghoulish burden fearfully dropped from the Clark street bridge at midnight by the guilty gas man who had planned the paintin' in the first place.

After which he goes home in a cab that is carefully halted nine blocks from his right address, removes his false whiskers, and prepares a fourteen-page

statement, illustrated with photygraphs, diagrams, and a certificate of sanity, denyin' that he had ever even thought of wastin' all that money on paint.

The next mornin', early, he notifies a bunch of prospective new consumers two blocks beyond his present main that, on account of the unexpected discovery of the new ninth planet, he will be unable to extend to serve them until General Motors common reaches 212 in the shade.

Then he dictates a peppy report on how much money he has saved his company. And it ain't until the prospective consumers have disgustedly signed up to cook by electricity, and they're givin' the old holder blood transfusions to save it from rust a couple of years later, that he gets wise that maybe good economy and good economics ain't so different in either spellin' or meanin', after all.

No, Sam, sometimes you've got to spend money in order to save money.

And what I'm drivin' at is that this is the year to do it. Outside of the genuwine economy of keepin' things always ship-shape, you don't want to forget that the gas companies had a finger in the palaver pie down in Washin'ton last Fall, when it was agreed and sort of promised that necessary construction and maintenance work was to go forward especially vigorous' durin' these so-called slack times.

An', if some of us has sort of wasted the winter, that ain't no argyment for wastin' the spring an' summer too.

If I had a holder to paint, I'd paint it in May, instead of waitin' till August when it was that much hotter an' no cheaper to swing alongside a steel shell in the sun all day.

An' if there was a couple of palin's off the plant fence, I'd replace 'em now instead of waitin' till nine more come off so the carpenter crew could make a day out of the job.

Not to speak of gas-making machinery. You know there ain't nothin' more calc'lated to give guts to a water-gas generator an' cause it to give out A-1 gas with a grin in its hot-valve an' its top-piece roarin' defiance to oil, coal, electricity, an' Senate committees, like a new linin' of fire brick.

Another thing, there ain't goin' to <u>be</u> a better year than this one for movin' up the birthdays of new equipment. If you're goin' to have an addition to your water gas machine family in the fall, why not pick out May or June for the happy event, and get the good of it that much sooner? As well as helpin' out the employment situwation, so the boys can get back to work and begin burnin' more gas in the home stoves again.

An' here's another tip to'ards that end: There's lads in the distribution department that think they'd catch cold if it wasn't for the hot breath of the merchandisin' department boys on the backs of their necks all the time, tryin' to make them extend the mains faster so they can sell more gas an' appliances.

Well, how about turnin' the tables? How about causin' some of the leadin' merchandisers in the outfit to drop senseless with surprise some mornin' by findin' some new mains in where the distribution department took the initiative?

Then watch the sales crew sweat signin' up the new consumers on the extension?

I admit that'd be revolutionary. But so was the air mail. An' I ain't seen no special public demand to go back to the old ways there.

All in all, Sam, a live one's got to live on his toes these days. That a thing has always been done one way has got to be practically a guarantee that it won't be done that way tomorrer. An' the sure way to get ahead in the gas game is to be the feller that thought of it first—whatever it is.

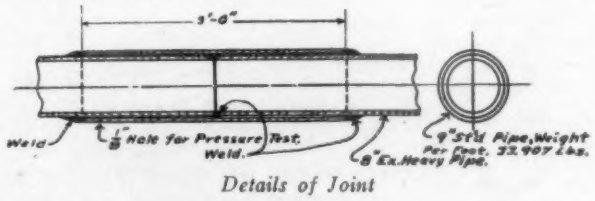
Meantime, don't forgit that this is the year to do what needs doin', an' not put it off till times are busier an' prices higher.

Yours for stayin' ahead of the pack,

Monoxide Mike

Novel Pipe Joint for River Crossing

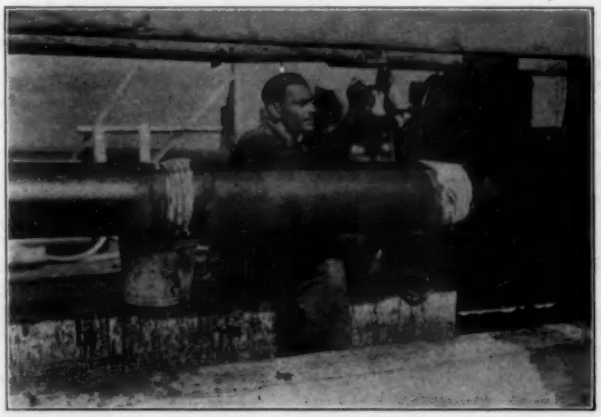
AN 8-in. gas line crossing the Hudson River from Beacon to Newburgh, where the river is somewhat over a mile in width, has recently been completed by the Central Hudson Gas & Electric Corporation. This line is of extra heavy pipe, designed for an ultimate pressure of 100 lb. per sq. in. and at present carrying a pressure of 45 lb. per sq. in. All joints were entirely welded by the oxy-acetylene process, the work having been done on a barge and the pipe lowered away into the river-bed as the welding progressed and the barge was moved forward



Details of Joint

A type of joint having several interesting features was designed and used for this river crossing. As shown in the drawing, it consists of a standard butt weld reinforced by a short piece of 9-in. standard pipe which fits over the butt weld and is welded to the pipe at both ends with fillet welds. This type of joint has several advantages. In the first place it stiffens the pipe at the joint against bending stresses, which may be very severe at times during the laying of the pipe from the barge. The sleeve also provides an extra factor of safety since two welds would have to prove defective before leakage could occur at any joint. Possibly the greatest advantage of this type of joint, however, is the time and trouble saved in testing the joints.

Each of the 9-in. pipe sleeves was provided with a hole threaded for a ⅛-in. pipe nipple. Because of the fact that an air compressor capable of providing the high test pressure required was not available, compressed nitrogen was used for testing. This was supplied at 1,800 lb. pressure in cylinders similar to oxygen cylinders. It is well understood that oxygen must never under any circumstances be used for pressure testing, because oxygen under pressure will react with explosive violence if it comes in contact with oil or grease. Testing procedure was as follows: A cylinder of compressed nitrogen was connected to the 5/32-in. annular space between pipe and sleeve by means of ⅛-in. pipe, fitted with a valve and pressure gage. The pressure was brought up to 350 lb. per sq. in. and soap suds were painted on the sleeve welds. If the pressure dropped and no leaks in the sleeve weld could be detected, this would indicate that the center butt weld was faulty and the pipe would have to be cut and rewelded. This, however, did not happen once during the entire operation. The annular space had a volume of about 1/10 cu. ft. and only nine cylinders of nitrogen were used in testing 163 joints in the crossing. It can readily be seen that a great saving of time and effort was effected by this method of testing as compared to pumping up the whole pipe. The illustration shows one of the joints undergoing test.



Joint Undergoing Test

Tests of Coated Pipe

Joint investigation of American Gas Association and Bureau of Standards

SCOTT EWING

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THE INVESTIGATION of protective coatings for pipe lines which the American Gas Association and Bureau of Standards have made possible, started one year ago. Numerous organizations and individuals who are interested in these tests are anxious to know what coatings are being tested and where the specimens have been buried. For this reason it seems desirable to describe the coatings in as detailed a manner as possible with the information at hand, and to give a general description of the places of burial.

All of the more important coating manufacturers were invited to enter the American Gas Association test and submit as many coatings as they desired. Among other things the manufacturers were required to pay a fee of $200 for each coating they wished to test. This money is to be used to help defray those expenses which vary with the number of coatings such as cost of application, freight, and cost of cleaning and rating the specimens. Fixed costs, such as salary and traveling expenses, are to be paid by the American Gas Association. This fee requirement served two distinct purposes; it limited the number of coatings to those in which the manufacturers had considerable faith, and it provided a means of preventing the American Gas Association and the Bureau of Standards from being overburdened with the expense of the test.

An Equitable Arrangement

Manufacturers shipped their coating material to the Galvanizing Plant of the National Tube Company; a schedule was arranged and each manufacturer's representative came there to supervise the application of his coating. The coatings were applied to shot-blasted pipes which were stored in a bin of lime to prevent them from rusting. This system of coating and subsequently burying under strictly comparative conditions the coated samples appears to have the following important advantages:

(1) There is no question as to how the coating was applied. The coating manufacturer has every advantage it is possible to give him so that failure cannot be easily attributed to faulty application. (2) Samples of the material are obtained at the time of application so that there is no question as to the authenticity of the samples taken. (3) The pipes were bright so that if rust appears on them later, it certainly has formed since the coating was applied. (4) The coatings do not have to be inspected in the bottom of a dark trench but will be brought to the laboratory where they can be referred to at any time in case any question should arise. In the laboratory they can be carefully studied so that it should be possible to get definite information as to just what happened to the coating while it was underground. (5) Laboratory tests can be made on the coatings with the object of developing a satisfactory method of test which may be applied to any coating at any future time. (6) By burying specimens we have wide choice of locations for burial and we can bury the specimens in the particular soils we are interested in, thus getting direct comparisons between different coatings in the same soils and the same coatings in different soils.

Publication approved by Director, Bureau of Standards. Article based on paper presented at Distribution Conference, American Gas Association, at St. Louis, Missouri, April 10.

Types of Coatings Tested

Table 1 is a list of the coatings in the test and some data concerning them. For the purpose of describing them in more detail the coatings have been divided into six classes in the following paragraphs.

a. *Bituminous enamels* are materials defined as having 15-40 per cent by weight of finely divided mineral fillers. Coatings which are ordinarily called enamels consist of a priming coat of a solution of bituminous substance and a coating of the enamel proper applied with a sling. (Fig. 1) Coatings B, H, R, S, W and WR (Table 1) fall into this class. The descriptions of these materials, as submitted by the manufacturers show that they are all different, both as to the kind of filler added and as to the physical properties of the product. All of these coatings had an electrical resistance greater than one megohm between the pipe and the water into which the specimen was dipped. The method of determining the resistance of the coating will be described later.

b. *Asphalt emulsions* consist of a liquid (water) phase in which the asphalt is dispersed by means of some emulsifying agent. The asphalt emulsions are all applied cold and most of the water evaporates leaving the asphalt on the pipe. Coatings E, EE, F, FF and G are in this class. Coating E contains asbestos fiber, EE had Portland cement dusted on it before the water evaporated (Fig. 2) and FF had Portland cement mixed with the coating material before it was applied. E, FF and G were applied with a brush, EE was applied by dipping full length pipe and by dipping 2-foot lengths of pipe in the emulsion. All of these coatings had a comparatively low electrical resistance when the caps were placed on them, and they appeared to conduct the current at every point.

c. *Cut-backs* consist of bituminous substances dissolved in a light petroleum distillate or coal tar solvent which evaporates when the coating is applied. Coatings K, L, M and SS belong in this class. All of them were applied cold with a brush. Coatings K and SS have coal tar base material with a filler, L has asphalt base material with asbestos fiber in it, and M has asphalt base material and no filler. They all consist of a priming coat and one or two outer coats of thicker material. Most of these materials dry rather slowly from the outer surface inward, and are not hard enough throughout to resist slight abrasions after several days. They are rather thin and in most cases if applied to greater thickness the material runs off the pipe. All of the cut-backs except L showed numerous leaks with the electrical test so that their resistance is rather low. Coating L dried to a rather hard, tough coating in one day and showed only 5 leaks in the 60 specimens. These leaks were repaired.

d. *The felt reinforced coatings* can best be described by further subdividing this class into four groups, based upon the methods that were used in their application. Coating BB was applied by hand, (Fig. 3) the pipe being rotated on saw horses while the felt was wrapped and sealed to the pipe by pouring molten pitch on it. Similar operation was used to put on the Kraft paper.

Pipes Fed Spirally

Coatings X and P were applied with the Pabco machine. (Fig. 4.) The pipes were driven spirally through the machine and the felt was drawn through a bath. If desired, Kraft paper can also be wrapped on the pipe in the same operation with this machine. It was used on the P coating but not on the X.

Coatings T, U and Z were applied with the Hill, Hubbell machine. (Fig. 5 and 6.) In this machine the pipe lengths are coupled together with special couplings and supported on "dollies." These travel on a track so that a continuous stream of pipe passes spirally through the machine. The primed pipe is bathed in molten bituminous substance which flows from an overhead tank onto a sling held under the pipe. A pump keeps the overhead tank full of hot bituminous substance. Another stream flows over the felt as it is wound on the pipe, and a third stream flows onto a second sling which coats the felt wrapped pipe. Kraft paper is then wrapped on the pipe. Ordinarily this is all done in one operation, but due to the flexibility of the 2-inch pipe which size is

TABLE I

Pipe Coatings in American Gas Association Tests

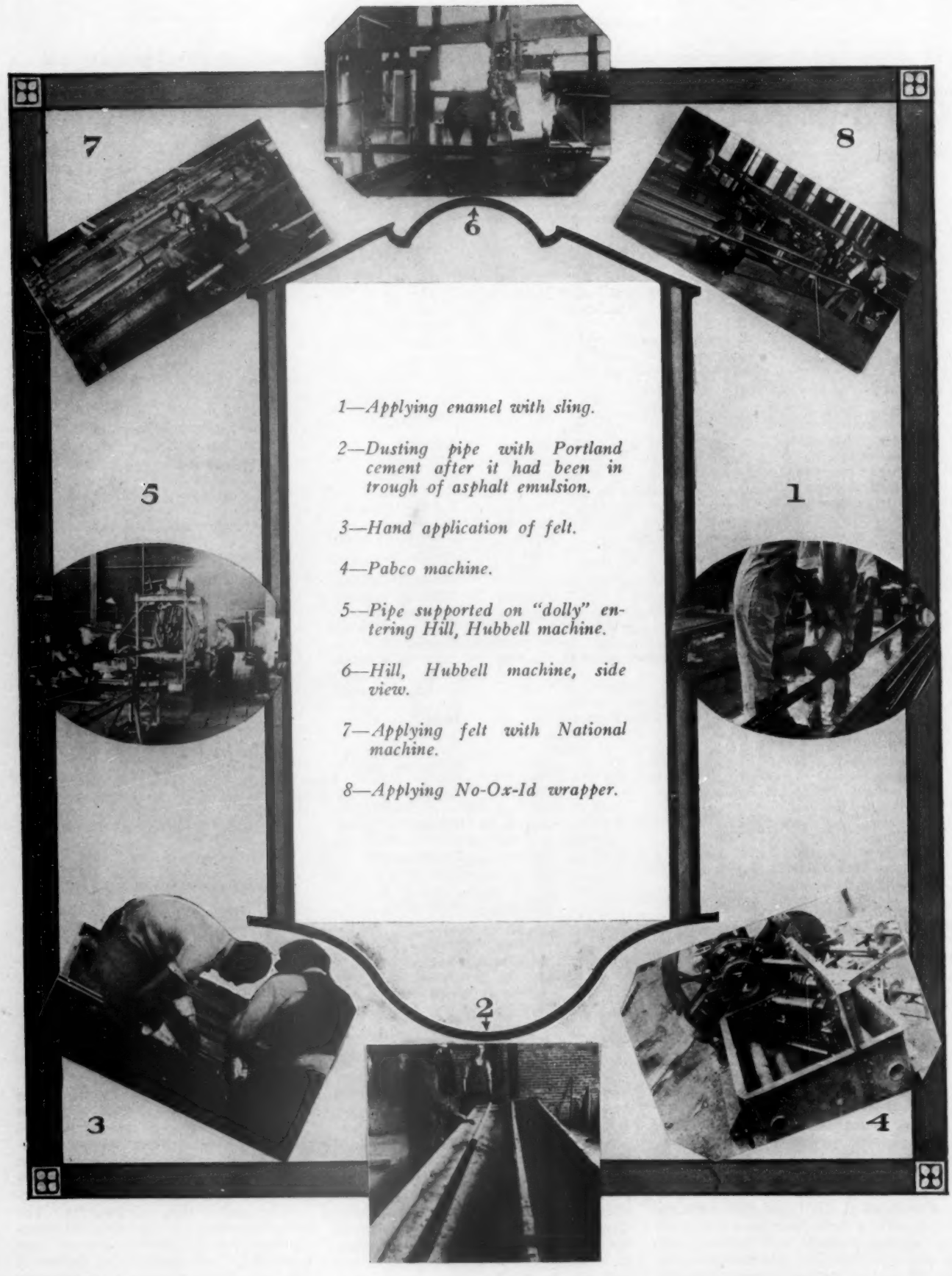
Sym-bol	Manufacturer or Agent	Method of Applying Primer	Trade Name of Primer	Method of Applying Coating	Trade Name of Coating	Fabric Reinforcement if any	Man hours to apply coatg.	Av. Temp. of Appln.	Av. Thickness in
A	Amer. Tar Prods. Co.	Brush, A.T.P. Primer		Sling	A.T.P. Pipe Coatg. No. 1	——	2.8	380	.070
B	Barrett Co.	Brush, B.P.L. Primer		Sling	B.P.L. Enamel	——	4.0	350	.038
BB	Barrett Co.	Brush, B.P.L. Primer		Hand	Pitch and Felt	*15 lb. rag felt	4.5	370	.134
C	Benjamin Foster Co.	Dipped no other treatment			I.B.M. Pipe Coating	——	3.0	—	.014
CC	Benjamin Foster Co.	Brush-hot, I.B.M. No. 1		Machine	I.B.M. No. 2	15 lb. asbestos	7.5	375	.120
D	Dearborn Chem. Co.	Brush, No-Ox-Id A special		Hand	No-Ox-Id G	No-Ox-Id muslin	7.5	cold	.054
DD	Dearborn Chem. Co.	Brush, No-Ox-Id G special		Hand	No-Ox-Id GX + G	No-Ox-Id muslin	10.5	280	.071
E	Emulsion Process Co.	Brush, E.P. No. 1		Brush	Parafalt	——	4.0	cold	.047
EE	Consolidated Gas Co. of N. Y.	Dipped and dusted with cement			Armored Hydralt	——	1.8	cold	.0605
F	Flintkote Co.	Dipped vertically, no other treatment			A.C.E.	——	4.0	cold	.082
FF	Flintkote Co.	Brush, A.C.E. + cement		Brush	A.C.E. + cement	——	4.0	cold	.029
G	Headley Good Roads Co.	Brush, Headley Noll		Brush	Headley Noll	——	3.75	cold	.016
H	Hill, Hubbell & Co.	Brush, Inhiburine		Sling	Biturine	——	2.0	470	.034
J	Johns-Manville Corp.	Brush, J.M. Tar Primer		Machine	J.M. Pitch No. 2	14 lb. asbestos	6.7	350	.163
JJ	Johns-Manville Corp.	Brush, J.M. Asphalt Primer		Machine	J.M. Asphalt	14 lb. asbestos	7.5	475	.126
K	Arco Company	Brush, Arco Ravenite		Brush	Save-a-line	——	3.5	cold	.009
L	Barber Asphalt Co.	Brush, Plastic Pipe Ctg.		Brush	P.P.C.	——	2.7	cold	.024
LL	Barber Asphalt Co.	Brush, Genasco Primer		Machine	——	*Sat. cotton sheet'g	5.8	cold	.056
M	McEverlast, Inc.	Brush, Penetration		Brush	Electrolysis Proof	——	4.3	cold	.010
MM	McEverlast, Inc.	Brush, Penetration		Sling and hand wrap	M.P.C.	Osnaburg	5.5	375	.080
N	National Tube Co.	Dipped, Robertson No. 228		Machine	National Coating	*Muslin	6.0	380	.146
NL	Lead Indus. Assn.	Brush, Red Lead		Machine	National Coating	*Muslin	6.25	380	.117
NS	National Tube Co.	Dipped, Robertson No. 228		Machine	National Coating	Muslin and steel	6.0	382	.147
NT	National Tube Co.	Dipped, Robertson No. 228		Extruded	Robertson No. 230	——	—	340	.131
P	Paraffine Co., Inc.	Brush, Pabco No. 440		Pabco Mach.	Floatine	*Pabco Felt	2.2	350	.123
Q	Albrecht Pagenstecher	Wrapped, no other treatment		Machine	Schades Wrapper	Schades Wrapper	6.0	cold	.051
R	Resistcor Eng. Corp.	Brush, Resist. Primer		Sling	Resistcor Enamel	——	2.0	400	.061
S	Sherwin-Williams Co.	Brush, Lyne-Kote Primer		Sling	Lyne-Kote Hot	——	2.0	420	.034
SS	Sherwin-Williams Co.	Brush, Lyne-Kote Primer		Brush	Lyne-Kote Cold	——	3.0	cold	.007
T	Texas Co.	Brush, Texaco Primer		Machine	Asphalt	*15 lb. rag felt	8.3	450	.150
U	Hill, Hubbell & Co.	Brush, Inhiburine		Machine	Biturine Spec. A-1	*30 lb. rag felt	3.6	425	.214
V	Iroquois Gas Corp.	Brush, Robertson No. 274		Hand	Robertson asphalt	Cheesecloth	2.6	420	.070
VV	Iroquois Gas Corp.	Brush, Robertson No. 274		Hand	Std. N. J. Brick Filler	Cheesecloth	3.0	410	.038
VX	Iroquois Gas Corp.	Brush, Inertol		Hand	Std. of N. J. Brick Filler	Cheesecloth	3.0	440	.041
W	Wailes, Dove-Hermiston Corp.	Brush, Bitumastic Sol.		Sling	Bitumastic Special	——	3.5	456	.058
WF	Wailes, Dove-Hermiston Corp.	Brush, Bitumastic Sol.		Machine	Bitumastic	15 lb. asbestos	6.7	425	.154
WL	Lead Indus. Assn.	Brush, Red lead		Sling	Bitumastic	——	3.2	450	.052
WR	Wailes, Dove-Hermiston Corp.	Brush, Bitumastic Sol.		Sling	Bitumastic	——	3.5	420	.0505
WW	Wailes, Dove-Hermiston Corp.	Brush, Bitumastic Sol.		Sling	Bitumastic	Wood veneer	3.3	420	.100
X	Milwaukee Gas Light Co.	Brush, Pabco Primer		Pabco Mach.	Floatine	Pabco rag felt	2.0	400	.123
Y	East Ohio Gas Co.	No Primer, ——		Hand	——	Sheeting	1.7	372	.115
Z	Hill, Hubbell & Co.	Brush, Inhiburine		Machine	Biturine Spec. AX1	*15 lb. asbestos	6.3	430	.119

* Final application Kraft paper.

seldom coated by this method, better results were obtained by coating the pipe for the test in two operations. However, only one operation was needed for coating U as the Kraft paper was wrapped on top of the felt without a second slinging operation.

Coatings CC, J, JJ and WF were applied with a lathe type machine in the galvanizing plant of the National Tube Company. (Fig. 7.) The pipe rotates in a lathe as a carriage moves along the pipe. The rolls of felt are mounted on the carriage. A pump could have been attached to the carriage to pump the hot bituminous substance on the felt as it was wrapped on the pipe, but the cost of cleaning the machine would have been greater than that of pouring the bituminous substance on the felt by hand. For this reason the latter method was used with the coatings that were prepared for these tests. The pipes for the CC coating were preheated and brushed with hot asphalt and then wrapped. Those for the WF coating were primed and coated with bitumastic enamel by means of a sling before they were wrapped, those for the J and JJ coatings were primed, wrapped and then coated with the bituminous substance with a sling.

Without exception all of the felt reinforced coatings showed an electrical resistance greater than one megohm. The time required to apply most of these coatings was considerably greater than it would be in actual practice because it was not economical or even possible to have the equipment in smooth working



1—Applying enamel with sling.

2—Dusting pipe with Portland cement after it had been in trough of asphalt emulsion.

3—Hand application of felt.

4—Pabco machine.

5—Pipe supported on "dolly" entering Hill, Hubbell machine.

6—Hill, Hubbell machine, side view.

7—Applying felt with National machine.

8—Applying No-Ox-Id wrapper.

order when only 120 feet of pipe were coated. Nevertheless the time required indicates that all of these coatings are practical and that their costs of application are not prohibitive.

e. *The cotton fabric reinforced coatings* are divided into hand applied and machine applied coatings. The hand applied coatings include D, DD, MM, V, VX, VV, and Y. The machine applied coatings include LL, N, NL, NS and Q. For all of the hand applied cotton fabrics except MM the pipe was rotated and the roll of fabric held at the proper angle so that it wrapped on the pipe. (Fig. 8.) For the MM coating the roll was passed around the stationary pipe. (Fig. 9.) The coat- (Fig. 10.) The preheated pipe was placed gas companies at their coating plants. ings V, VV, VX and Y were applied by on rolls over a trough of molten asphalt. Asphalt was poured over the pipe and the cotton fabric was wrapped on while the pipe was hot Another layer of asphalt was then poured over the fabric.

Lathe Type Machine Used

In all the machine applied cotton fabric reinforced coatings, the lathe type wrapping machine, which was described under felt reinforced coatings was used. (Fig. 11.) The LL and Q coatings were applied cold while for all the others the cotton fabric passed through molden asphalt before it went on the pipe.

None of the hand-applied coatings in this class were covered with paper, the fabric in all cases being coated with the coating material. All of the machine-applied coatings in this group except Q and NS were covered with an outer fabric of paper. Q had no outer fabric on it and NS was wrapped with 30 gauge sheet steel.

None of the gas company coatings were tested for electrical resistance and the NS coating could not be tested because the steel shell was in contact with the pipe at the ends of the specimens. All of the remainder of the coatings in this group except Q showed a resistance greater than 1 megohm. The Q coating material is not a conductor but there were numerous pin-holes in it.

f. *Miscellaneous coatings* which do not fall into the above classes are A, C, WL, WW and NT. All of these coatings were applied hot. They were all applied with a sling except C and NT. In applying coating C the full length, preheated pipe was dipped in the molten coating material which has an asphalt base. (Fig. 12.) Coating NT is an asphalt mastic containing a high percentage of mineral filler. This was extruded on pipe that was previously dipped in low melting point asphalt. At the present time this is strictly an experimental coating. Coating A does not contain a filler and has a coal tar base. WL and WW are both Bitumastic enamel, the first being applied to pipe that was painted with red lead and the second being covered with a shell of wood veneer .05 inch thick. All of these coatings had an electrical resistance greater than one megohm when the specimens were prepared.

Preparation of the Specimens

After the full length pipe was coated, it was cut in 2-foot lengths by means of a threading machine and a three-wheel pipe cutter. (Fig. 13.) Each specimen was then marked in 4 places with the letter designating the coating and a number. (Fig. 14.) Sixty specimens of each coating were made and they were numbered from 1 to 60.

Tin cans were sealed on the ends as caps for the specimens with whatever sealing material the manufacturer thought best, and they were sealed so that the pipe was not in contact with the can. (Fig .15.) The cans serve several purposes: They cover up the ends of the specimens so that moisture cannot creep under the coating, and the coating is exposed in the same way it would be exposed on an actual line. They prevent the soil and water from entering the pipe and corroding it on the inside. They support the pipe in the trench so that it does not rest on the bottom of the trench, which is the way an actual pipe line lies over the greater part of its length. They take all the wear and tear of shipment, for the coated pipe cannot touch anything while it is in the shipping box. They make it possible to determine the approximate resistance of the coating.

After one can was sealed on one end the specimens were tested for electrical resistance. If there was conduction due to pin-holes caused by faulty application, the holes were repaired. If the holes were so numerous that they appeared to be characteristic of the coating, no attempt was made to repair them. The method of making this test for electrical resistance consists of dipping the specimen in an iron tank full of water so that the specimen was almost completely immersed. One terminal of a dry cell is connected to the metallic container; the other was connected to the pipe through a 1000-ohm resistance and a milliammeter having a full scale deflection of one milliampere. The deflection of the milliammeter for each specimen was recorded. The 1000-ohm resistance is for the purpose of protecting the instrument in case the coating has a very low resistance. After the other can was placed on the specimens they were packed in boxes and shipped to the places of burial.

Burial of the Specimens

1. *General Method of Burial.* Table II describes the places of burial of the specimens; 4 specimens of each coating are buried in each location. The specimens are laid cross-wise in the bottom of the trench, with 9 inches between the centers of adjacent specimens. In each location the specimens are divided into 4 groups, each group containing one specimen of each coating. Each group was laid in a trench in the same order that the coatings are arranged in Table 1. A bare specimen was buried at each end of each group. The specimens will be removed at 4 separate times, one group being removed from each location at a time. It is planned to remove the first groups in September, 1930. The following paragraphs give a description of soils and burial places.

a. *Cinders.*—Some distribution men feel that cinders are the cause of all of the corrosion of their mains, and almost everyone believes that cinders are a source of considerable trouble. The composition of cinders probably varies over a wide range and their corrosiveness probably also varies widely. The sharp angular fragments will probably press holes in the softer coatings. The location at Pittsburgh is in an old bed of cinders that is high and well drained. At Milwaukee the trench is near a canal, in which the level of the water is usually at about the level of the specimens. In this place the cinders are fresh.

b. *Tidal Marsh.*—About 2500 square miles of tidal marsh have been mapped along the Atlantic and Gulf coasts. As the name implies, the surface of the marshes is practically flat and is covered with ocean water at high tide. The soil material varies from dark, oozy sediments interspersed with coarse marsh-grass roots to a yellowish or dark colored clay which rests at 2 to 4 feet upon still darker-colored clay. The subsoil and free water of the soil are charged with hydrogen sulphide. The vegetation consists mostly of salt grass. Most of the dipped coatings which were removed from tidal

TABLE II

Burial Scheme of American Gas Association Pipe Coatings

Specimen Numbers	Soil	City	Cooperating Utility
1-4	Cinders	Pittsburgh, Pa.	Equitable Gas Co.
5-8	Cinders	Milwaukee, Wis.	Milwaukee Gas Lt. Co.
9-12	Tidal marsh	Marshfield, Mass.	Brockton Gas Lt. Co.
13-16	Tidal marsh	Atlantic City, N. J.	Atlantic City Gas Co.
17-20	Muck	West Palm Beach,	Florida Pub. Uts. Co.
21-24	Muck	Miami, Fla	Florida Pr. & Lt. Co.
25-28	Cecil clay loam	Atlanta, Ga.	Atlanta Gas Lt. Co.
29-32	Cecil fine sand loam	Raleigh, N. C.	Raleigh Gas Co.
33-36	Susquehanna clay	Shreveport, La.	Sthn. Cities Dist. Co.
37-40	Miller clay	Shreveport, La.	Sthn. Cities Dist. Co.
41-44	Miller clay	Bryan, Texas	Community Nat. Gas Co.
45-48	Alkali soil largely sulphates	Los Angeles, Calif.	L. A. Gas & Elec. Corp.
49-52	Alkali soil largely carbonates	Los Angeles, Calif.	L. A. Gas & Elec. Corp.
53-55	Marshall silt loam	Kansas City, Mo.	Kansas City Gas Co.
56-60	Bureau of Standards for laboratory tests. (not buried)		

marsh by the Bureau of Standards in 1926 after a burial of about 2 years were in a rather bad condition. The original Bureau burial place in tidal marsh is near an oil refinery and much of the waste from the refinery flows in a nearby tidal stream. For this reason this location may not be typical of average conditions in this soil and so new locations were chosen at Atlantic City (Fig. 16) and Brockton, Mass.

Distribution of Muck

c. *Muck*—Areas of muck are found distributed over the entire United States, especially along sluggish streams and in low, swampy places where the remains of growing plants have been partially preserved under water. These areas are small and widely scattered. Areas of peat or muck or both have been mapped in 28 states. Muck is a soil containing between 25 and 65 per cent of organic matter. The bare and coated pipes that have been removed by the Bureau of Standards from muck in New Orleans show that it is a very destructive soil. The New Orleans soil contains considerable filled material and is not typical of average conditions in this type, so new locations were chosen in West Palm Beach and Miami. These cities are adjacent to the Everglades, which is the largest body of organic soil types in the United States.

d. *Cecil Series.*—These soils are most prevalent in the southern Piedmont, where they are the most important soils. This series occupies about one-third of the entire Piedmont plateau, having an area of about 25,000 square miles. The soils of the Cecil series have grayish brown surface soils in the sandy types to reddish brown and even red surface soils in the heavier types, and a red, stiff brittle clay subsoil. The parent rock, which is of igneous origin, is predominantly granite or gneiss, is found at depths ranging from 3 to perhaps as great as 30 feet. Rock fragments are often found in the soil. Quartz sand is nearly always present in the subsoil and is often on the surface, especially in the sandy types. This soil is not as destructive to pipe or coatings as either muck or tidal marsh but it ranks eighth among the 47 burial locations in pitting rate. One set of specimens is buried at the original Bureau of Standards location at Atlanta and the other set is in a new location at Raleigh. This soil was chosen because it has a large area and it is one of the best examples of an old well-weathered soil.

e. *Susquehanna Clay.*—The soils of the Susquehanna series are developed most extensively in the higher portions of the coastal plain from the vicinity of Chesapeake Bay to central Texas. The area of this series is approximately 12,000 square miles in the states of Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Oklahoma and Arkansas. The fine sandy loam and the clay are the principal types. These are grayish (in the sandy types) to red (in the clay), with stiff plastic, red heavy clay subsoils, which become mottled in the lower part with gray or bluish gray, red and yellow. Often the mottling begins just beneath the soil. This layer extends to from 60 to 72 inches; the mottling is usually red in the upper and light gray in the lower part. Below this is the parent material which consists of alternating layers of light gray or bluish gray clay and brownish yellow fine sandy material. The surface of these stiff lands is characteristically rolling to hilly but the topography is usually more subdued west of the Mississippi. One set of specimens is buried in this soil at Shreveport, La., near some bare specimens that were buried by the Bureau of Standards in 1928.

f. *Miller Clay.*—The soils of this series are typically developed in the first overflow bottoms of streams, usually from the Permian red bed region. They are found along the Brazos and Red rivers in Texas and Louisiana. Considerable areas are but rarely overflowed. Approximately 2,500 square miles of Miller soils have been mapped in the states of Arkansas, Louisiana, Texas and Oklahoma. The Miller series includes soils of chocolate brown to pinkish red color, with chocolate red or pinkish red subsoils. One set of specimens is buried on the first terrace of the Red River near Shreveport (Fig. 17) and one set near the Little Brazos River about 10 miles west of Bryan, Texas. Specimens were buried in the Susquehanna and Miller soils because they are very heavy soils and they shrink a large amount upon drying out. The effect of soil stress on the coatings should be a maximum in these soils if soil stress is due to the shrinkage and swelling of the soil.

g. *Alkali Soils.*—Two sets of specimens will be buried in the vicinity of Los Angeles in two locations, in one of which the soil alkali is principally sulphates and in the other the soil alkali is unusually high in carbonates. These specimens will be buried in about 2 months.

h. *Silt Loam.*—An incomplete set of specimens will be buried soon in Marshall silt loam in the vicinity of Kansas City. This soil is perhaps the most extensive soil in the United States. This is a dark colored prairie soil derived directly from the weathering of the loess mantle which was distributed over the central part of the Mississippi drainage system by the wind. This soil is not particularly corrosive nor is it likely to prove very destructive to coatings. However, it was thought that it would be advisable to bury one set of specimens where conditions are about average.

Laboratory Test of Coatings

Numerous laboratory tests of both coating materials and of coatings have been made in the past, and many are being made at the present time. These tests are valuable if for no other reason than that they show what the properties of the various coatings are. However, investigators interpret many of these tests in different ways; in fact one of the reasons why there is such a wide variety of coatings for pipe lines is because individuals have different ideas as to what a successful coating should be. Hence it is evident that in this investigation we should learn all we possibly can as to the laboratory behavior of the coatings in the test so that when we obtain the be able to define the properties of the results from the buried specimens we may best coatings.

A panoramic photograph of the surface of one specimen of each coating has been made so that there is a permanent record of the original appearance of each coating. Before the specimens were photographed a thin layer of wet clay was placed on part of the specimens, allowed to dry, and then washed off. When the specimens are removed it should be possible to tell whether the above test has any value.

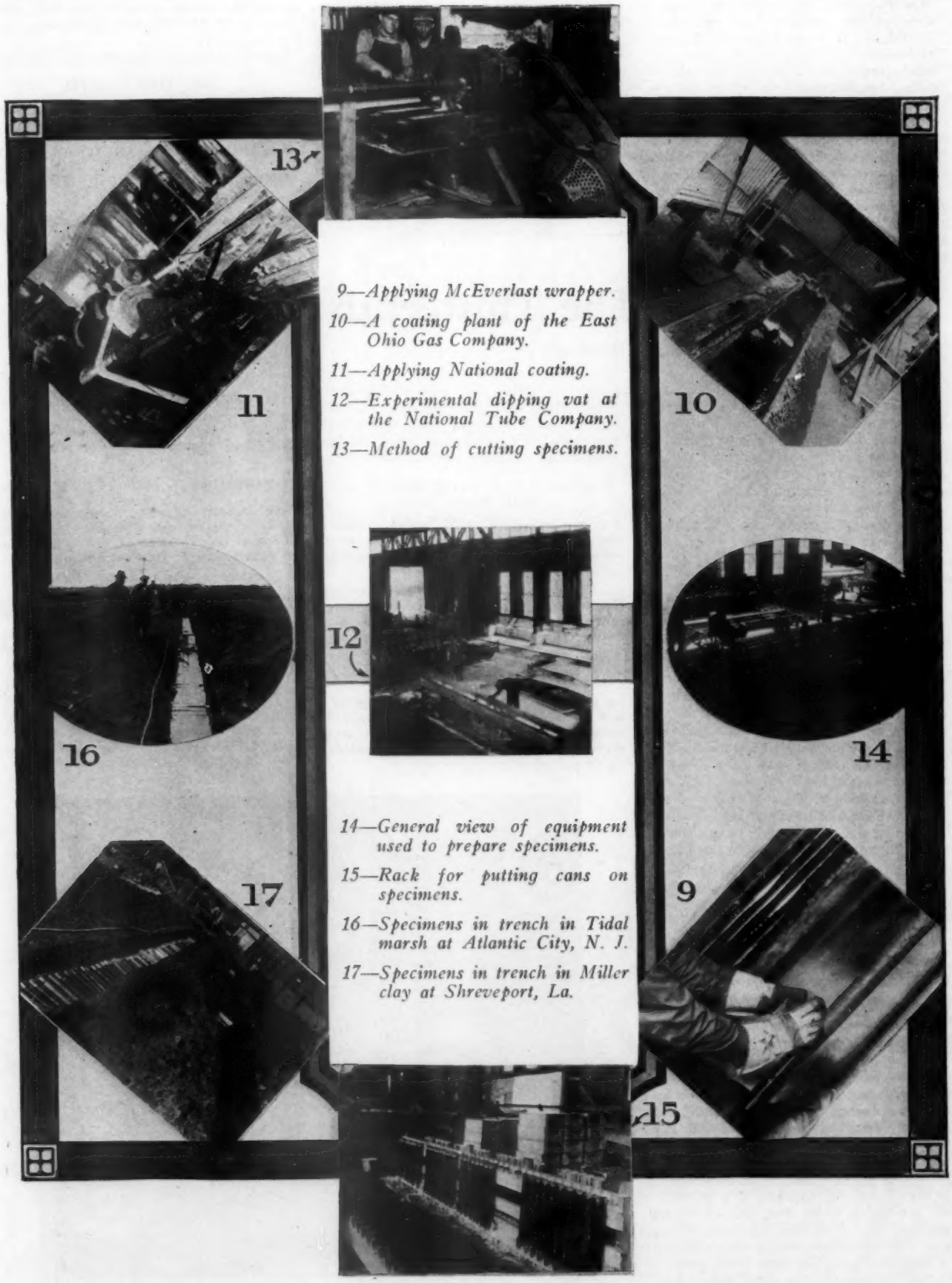
Findings Will Be Complete

It is anticipated that before the specimens are removed next fall all the important physical characteristics of the coating materials will be determined. An attempt is being made to develop a satisfactory method of rating the specimens when they are removed. At this time it is impossible to say how successful this will be but the few results obtained so far look promising.

As a part of its contribution to this investigation, the Bureau of Standards agreed to try to develop some method of testing coatings so that at any future time it will be possible to tell something about the value of any protective coating by some short laboratory test. The first thing to do in trying to develop such a test appears to be to try some of the methods of test that are now being used and see how the results of the test compare with the performance of the coated specimens that have been buried.

One method that has been proposed (F. W. Karl, A. I. M. M. E. Proc., 1927, p. 528) consists of placing the coated pipe in an electrolyte, taking care to protect the ends, and measuring the resistance of the coating from time to time. A specimen of each of the coatings in the test was sawed into two equal parts. One of these parts was placed in a one-gallon crock, the end with the can on being downward. The crock was filled with a 10 per cent sodium chloride solution and the resistance was measured between the pipe and a carbon electrode placed in the salt solution. The method of measuring the resistance was essentially the same as the method used to measure soil resistance with the earth-current meter, but the voltage was only one volt and more sensitive instruments were used to measure the current. A layer of paraffin was poured over the water to prevent evaporation. The test is still in progress, the resistance of each coating being measured every week.

Twelve of the 41 specimens developed leaks in the cans and these tests are to be repeated. At the end of seven weeks fourteen of the remaining coatings had a resistance so high it could not be measured with any precision. The resistance of the others decreased with the time, except in two cases where it dropped to a low value and then increased a little. The initial resistances of the different coatings varied from about 3 ohms to at least several megohms, and after seven weeks the resistances extend over about



9—Applying McEverlast wrapper.

10—A coating plant of the East Ohio Gas Company.

11—Applying National coating.

12—Experimental dipping vat at the National Tube Company.

13—Method of cutting specimens.

14—General view of equipment used to prepare specimens.

15—Rack for putting cans on specimens.

16—Specimens in trench in Tidal marsh at Atlantic City, N. J.

17—Specimens in trench in Miller clay at Shreveport, La.

the same range. If the value of a coating depends upon its electrical resistance some of the coatings must certainly be worthless. If a rapid rate of change of resistance indicates failure, then other coatings are of no value. The coatings do not break down at a definite time, but the resistance gradually decreases. It is difficult to interpret the results of this test at the present time.

The Bureau has also started another set of tests similar to that described by K. H. Logan in *Oil and Gas Journal* of May 2, 1929, page 33. In this test the coatings are exposed to a heavy clay soil and the resistance of the coating is being measured by a method similar to that used in the salt solution tests. This test has just been started and it will probably extend over a period of several months. The boxes will be wet only at long intervals so that the effect of the drying and shrinking of the soil can be observed.

Lucky Friday, The Thirteenth

W. B. STODDARD

IN JUNE comes that combination that used to strike terror to the heart of the superstitious—Friday, the Thirteenth. With the modern tendency to "turn the dark clouds inside out" to show the silver lining, many firms are now staging special Lucky Friday the Thirteenth Sales. Such a sale may be utilized to clear out broken lines, to stress special appliances or to stimulate the volume of business generally. The event lends itself to interesting advertising treatment and display. All sorts of ancient superstitions may be exploited—the black cat, owl, horseshoe, ladder, and the broken mirror, coupled with copy stressing the superstition idea. The gas companies, ever among the most progressive business men of any community, have seized upon this date in a number of different sections of the country, and all report excellent success.

"Our campaign netted us the sale of 21 heat control cabinet gas ranges, which was not so bad for a one day sale," said J. W. Crankshaw, sales manager of the Allentown-Bethlehem, Pa., Gas Co. "We decided to specialize on gas ranges, so we ran a big ad, adorned with black cats and witches, as well as a cut of the range, saying:

TODAY IS YOUR LUCKY DAY

Don't Be Superstitious
One Day Only—Friday, the 13th
$13.00 allowance for your old Gas range taken in exchange

A small down payment and thirteen months to pay the balance

"Small 3 x 4 inch teaser ads preceded the appeaarnce of the big one. These announced "Friday is your Lucky Day," and naturally everybody wanted to know why this was so, and the Friday announcement was awaited with interest. An interesting feature of the sale, aside from those stated in the ad, was the free gift of a $13 radiant gas heater, to the first, thirteenth, and any multiple of thirteen, customer. Only heat control cabinet ranges were included in this very generous offer."

The Chattanooga Gas Co., Chattanooga, Tenn., likewise put on a special sale of gas ranges, in which "13" bore an important part. Their half page ad showed at the top a four leaf clover, upon which was superimposed a modern gas range, the announcement reading:

GOOD LUCK SALE TODAY—
FRIDAY the 13th

We are going to make today, Friday, the 13th, the luckiest day in the year for 13 Chattanooga families, as on this date we will put on sale

13 Modern Oven Heat Controlled Cabinet Gas Ranges which will bring lasting good luck and happiness to the home, for they eliminate all cooking failures. On this

FRIDAY, THE THIRTEENTH

we will reduce the price 13%; will allow an additional $13.00 for your old range; and for your convenience will divide the balance in 13 equal monthly payments. If you are not ready to have the range installed we will hold up delivery for 13 days.

DON'T FORGET THE DATE, FRIDAY

THE THIRTEENTH

Sale opens at 8:13 A.M., and closes at 5:13 P.M.

BETTER COME EARLY, AS ONLY 13 RANGES WILL BE SOLD AT ABOVE LIBERAL REDUCTION IN PRICE.

"Rain or shine, Gas is dependable, all the time."

The Beacon Gas Light Co., featuring a special sale of thirteen gas heaters, ran a clever ad:

"BAD 'CESS TO BAD LUCK!"

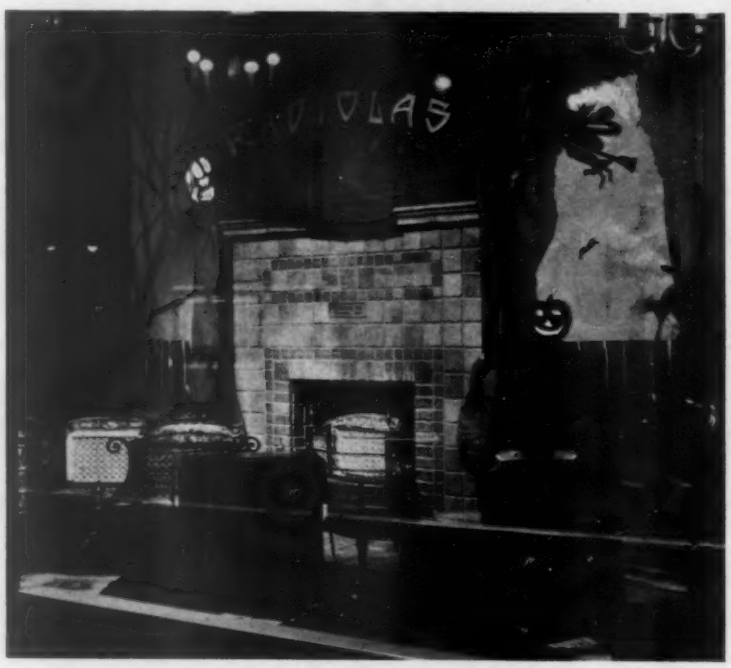
Friday Is Unlucky—Thirteenth Is Unlucky

Now don't you remember that way back in your school days, one of the hardest things for you to believe was that "two negatives make a positive"?

TOMORROW IS FRIDAY, THE 13th

Two negatives, one positive. Your lucky day, as we will have on sale Thirteen Gas Heaters of different types at prices which you cannot afford to miss.

They backed up their printed publicity with a striking window display. It was a library setting, with a fireplace of glazed brick in which was a radiant fire. At either side of the fireplace were long French windows, with drawn shades, against which were silhouetted bare branches of trees, upon which perched owls; while a witch on her broom was



A Friday-Thirteenth Window Display

seen riding through the sky. Scattered through the room were the 13 heaters placed on special sale. Several were of patterns that were being discontinued, and others, stoves that had been in stock for a number of months, but all of them excellent bargains at the price at which they were offered. The best feature of the sale according to the manager, was the number of people it brought to the salesroom, some of whom purchased other appliances, while a number of excellent prospects were secured for gas ranges and furnaces.

The New Haven Gas Light Co., New Haven, Conn., instead of specializing on any ranges, or any small appliances, conducted a sale on all of their lines, some of the features of nearly all the previously mentioned companies being included in their plan. Their ad had a black heading "Special Friday the 13th Sale," surrounded by a row of black cats. Beneath this was printed:

ARE YOU SUPERSTITIOUS?

For This Day Only
we will allow 13% to the purchaser of a gas range, water heater, radiantfire, radiator, incinerator or laundry dryer.

AND—

To the 13th purchaser, and each 13th purchaser thereafter, an additional 13% discount.

CASH OR BUDGET PLAN

"This one day merchandise sale, on Friday, the 13th, represented $4,601.91 of appliances sold to our patrons," said P. J. Naschold, sales manager of the company. "In New Haven we found that the age old superstition regarding the black luck of Friday the Thirteenth was banished completely in the face of actual bargains to be secured. We ran three special ads, in the three local newspapers, setting forth the features of the one day sale, as outlined above. When the day's activities had been completed, it was found that we had sold eight insulated oven ranges, five cabinet oven ranges, one single oven range, fifteen automatic water heaters, six room heaters, and six circulating water heaters. The result of the sales would seem to indicate that people are willing to take advantage of a bargain, even when it is offered them on a day when in the past they would have considered it the better part of valor to do everything with fingers crossed."

An Apropos Display

Portland, Oregon, Gas Company Lays Big Egg in Window

SPECIAL CORRESPONDENT

TYING up with events of the day is of course a practice indulged in by every merchant in his displays of advertising and therefore nothing new.

But the enormous Easter egg picture here is unusually striking.

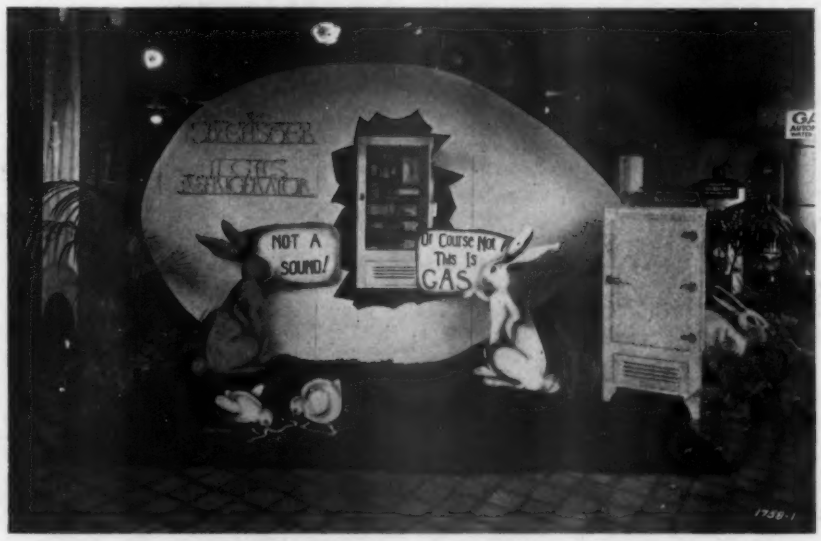
It was conceived by the Advertising Manager of the Portland Gas & Coke Company, who was the originator of the two Dromios, one on each side of the Gas Refrigerator, the one saying "Not Sound' and the other one answering, "Of course not—this is Gas.' The Dromios have made such a hit that drawings of them have been requested by various Gas Companies in the East, South and Middle West, I am informed.

In order to tie up with the Easter traditions, rabbits replaced the Dromios and while they do not lend themselves so well to the humorous impression which the funny faces of the Dromios made, nevertheless, they are in keeping with the Easter ideas, as are also the little yellow chicks quarreling about a worm.

The Easter Egg was in purple and the words,

A Gas
Refrigerator
For Easter

were in sparkling silver.



A Window Display that Tells a Story

An outstanding feature is the Refrigerator on the right, which has been completely covered with sparkling glass crystal metallics, which make it look like a big jewel. By throwing on colored spotlights it becomes a thing of beauty, being opalescent, the colors changing as one passes along. This sparkling frosting has been used a great deal of late on theatrical announcements, but covering a refrigerator with it is a novelty and makes it stand out like a big, sparkling jewel.

"It was rather stretching my conscience," said John H. Hartog, Advertising and Sales Manager of the Portland Gas & Coke Company, when interviewed, "to spend good money for rabbits at Easter time, because of the fact that rabbits and eggs have nothing to do with the thought of Easter, as the majority of Christians understand this feast day. I am fully aware of the fact that the Easter feast is taken from a heathen celebration and that the egg and the rabbits represented their ideas of the symbolism of fecundity which was the underlying thought of the forerunner of what later crept in as an "Easter" celebration, and was particularly devoted to the Spring Season, when everything comes to life,—in other words, closely connected with sun worship, considering the Sun as the Creator and life-giver. But in advertising one has to go with the stream and not let his own ideas or convictions go contrary to what is generally accepted as fact, for after all, the main thing is to catch the eye, to draw attention, to be noticed and if the public thinks that a rabbit has something to do with the resurrection, why, let it go at that."

Incidentally, the Portland Gas & Coke Company is increasing its Gas Refrigerator business by leaps and bounds Mr. Hartog said and he feels quite confident that Gas Refrigeration stepped into the breach at a time when something of the kind was most needed to preserve the cooking load, especially in Apartment Houses.

Merchandising Views and Reviews

THE gas man seems to have at last decided that it is profitable to keep hammering away at the full line of appliances he has to sell. We note many instances of added interest in incinerators, clothes dryers and room and garage heaters, in season. These efforts to acquaint the great mass-class with the fact that such appliances may be had is

These two sections appeared as one advt. measuring 1⅞" wide x 12" long.

being done through the use of newspaper advertisements. These advertisements as a rule do not run to full or half page splashes but are usually what may be termed small advertisements varying from one hundred to one hundred and fifty lines. But the advertisements appear more frequently and we would say, for that reason should be more profitable. Constant pegging away will sell these needed appliances.

MUCH of the gas company's May advertising is being directed to the new home manager, the June bride, and rightly, for she is the big purchasing agent of the future ten or fifteen years. Getting a customer of this kind is an investment, one on which you make a profit next year and the next and secure dividends for many years to come. Treat this new customer kindly, show her all the appliances she should have to make her new home an efficient one and you will go a long ways in building up the sales of gas per meter. Remember the bride needs every convenience you have to offer from a range to a refrigerator, so why not lump the whole job and let her work the payments into her budget. It's worth what it takes to try it.

DESPITE the talk of unemployment, news trickles in from all directions that "business is good" for the appliance salesman who exposes himself to sales. "Aint that so all the time!" said the merchandise manager of one of the big producers of electrical appliances. "If more men would get out and visit more homes instead of spending a couple of hours each morning and afternoon swapping conditions with fellow salesmen, there would be plenty of business. I find that where our central station customers have a plan and are exerting every effort to carry it out to the letter business is showing a nice increase over last year, while on the other hand I know of men who claim that it is not worth while to look for new business."

It's all in the way you go at the matter of selling, and your success may be measured by the amount of effort you put out. It is a sure thing that business is not any easier to get today than it ever has been, yet strange as it may seem, it appears to come easy to the man who exposes himself to sales.

DIRECT Advertising has had its flares in the gas industry. Some there are who have had wonderful success with it, while others seem to have had poor luck. In checking and double checking results we have found that where direct advertising has failed to attain results the failure was not chargeable to direct advertising but to the plan of its use, or better, to lack of plan of use. To secure results from this type of advertising two things are necessary; first, planning the release of mailings and second, a personal follow-up of all mailings.

A plan devised with these things in mind has been worked out recently by the Cleveland Heater Company. This plan consists of a series of letters to be sent to home managers. The letters do not undertake to sell gas water heaters, but comfort, convenience, cleanliness and automatic, safe hot water service for the home. The material and method of appeal is a distinct departure from the usual direct mail material offered by the manufacturer. For instance the whole appeal is based on the feminine outlook; pastel colors for envelopes and paper, and soft paper, together with timely illustrations on an enclosure go to make up a campaign that will interest the gas man who is looking for ways and means to build up his sales of automatic gas water heaters.

AMONG the helpful ideas offered the gas man who is interested in making his city a smokeless city is a portfolio issued by the Roberts-Gordon folks of Buffalo. This portfolio contains two merchandising plans, five pages of suggestions for laying out newspaper advertisements, samples of a number of duplex mailing pieces and a very complete merchandising plan to aid in the sale of Roberts Gas Heating Units.

A NUMBER of gas men are going after gas house heating this year in a big way. We have heard of quite a few companies that are planning to start their

activities early in June with a newspaper advertising campaign supplemented by a direct mail drive to a preferred list of prospective users.

One company reports that their house heating department is now being organized to make one of the most thorough jobs of following up a preferred list of prospective users that it has ever undertaken in connection with the sale of any appliance, while still others report that their advertising material is about ready to be released. 1930 promises to be a big gas house heating year in both the manufactured and natural gas fields.

WE WOULD rank the current advertisements of the Consolidated Gas Company New York as "hot stuff." These advertisements, as will be noted from the reproductions on this page, contain all the elements so essential to good advertising; human interest appeal, good typography and splendid lay-out and illustrations. As a whole they are very pleasing and contain enough color to cause them to stand out on any printed page. The lay-out too has been thoughtfully planned; it is of the type that assures that it will be numbered among "those present" on any page and not buried. We commend these advertisements to the advertising men of the gas industry.

TREAD-MILL.....

Does the running of your home depend on your ability to run up and down the stairs every time there is a need for hot water in the house?

How long do you expect your health and charm to stand that daily grind?

Before it is too late, ask your Gas Company to install an Automatic Storage Water Heater.

You can try it without obligation for 30 days; or buy it at once by making a first payment of only $5.

Light it—then forget about it ever after. Complete details at your Gas Company office. Or mail the coupon which is attached for your ready convenience.

Gentlemen: Please send me more information about Automatic Water Heating

Name.....

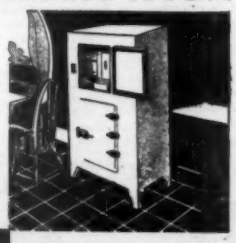
Address.....

City..... State.....

CONSOLIDATED GAS COMPANY OF NEW YORK

4 IRVING PLACE TEL. STUYVESANT 4900

silent GAS REFRIGERATION



$10 DOWN PAYMENT

and the balance payable on liberal installments out of income places a silent Gas Refrigerator in your home. This remarkable offer is good only during the month of April. Visit your Gas Company today!

$10

April is your opportunity month

CONSOLIDATED GAS COMPANY OF NEW YORK

INTERRUPTION....

"Jones, will you please go down and start the hot water!"

The harmony and quiet of the family dinner hour shattered again by imperious household cares!

Such interruptions can never happen in a household that is properly equipped with automatic water heating appliances.

With dependable gas heat, a well-insulated storage tank, and thermostatic control, your hot water supply is always ready at every faucet, and at exactly the temperature you need.

An automatic storage heater is as easy to install as a new gas range. You can arrange a 30-day free trial in your own home without the slightest obligation; or you can buy it at once by making a first payment of only five dollars ($5.00).

This is just the time to get rid of your old hand-operated heater or furnace coil.

If you have any questions, ask them today.

The attached coupon is for your use and convenience.

Gentlemen: Please send me more information about Automatic Water Heating

Name.....

Address.....

City..... State.....

CONSOLIDATED GAS COMPANY OF NEW YORK

4 IRVING PLACE TEL. STUYVESANT 4900

ELECTROLUX has taken a step forward and is offering the display and advertising gas men an opportunity to earn some extra money for the vacation period by designing unusual advertisements and window displays featuring Electrolux.

It is good to see the manufacturers step out in this way and encourage the men whose job it is to aid in the promotion of wanted appliances. Any competition of this kind is good for both the manufacturer and the industry and frequently uncovers many new and useful ideas.

WHAT have you seen lately by way of an advertisement that suggested to the man building a new home or modernizing an old one that he should have it *piped for gas?* We must confess that the old-time advertisement so headed seems to have been discarded—yet we see no valid reason for it. What kind of a house is it without proper gas piping? Why doesn't the gas man look after this business any more? Gas piping for range, clothes dryer, incinerator, refrigerator, and room heaters should go into all the new homes and it seems that it is up to the gas man to see to it that such piping is provided for in the specifications, even if he is not in the piping business.

Advertisements based on the fact that it is more practical and less expensive to having piping installed when the house is being built will do much to increase the home builders' interest in gas service and build up considerable good will for the gas man. Where the gas company does piping why would it not be profitable to conduct an old fashioned house piping campaign? To the man who says; "Well now with salesmen working on a commission basis you could not get 'em to sell house piping," we ask, "Why not?" You can, if you are willing to pay for this new business on the same plan that was used in the old days when gas companies went after this business and paid a flat amount per outlet.

THE LAMP MERCHANT, a Westinghouse publication says: "the staff always mirrors the executive. In every business concern the ideas, thoughts and habits of the executive are reflected by the rest of the organization. If he is not prompt, if he does not keep his word, if his desk is sloppy, if he yells over the phone and if he does a thousand and one other things that are not good business, all hands, down to the office boy, follow along to a more or less marked degree.

"If you doubt this statement, look over your own organization, beginning at the bottom, and compare their individual actions with your own, and see whether, after all, you are at fault."

This test might be applied to your business, if sales are not coming along as they should be. If you are not installing refrigerators, automatic gas water heaters, up-to-the-minute gas ranges, incinerators and laundry dryers, maybe your ideas are out of focus and your thoughts wool gathering. And perhaps you are not advertising and displaying these wanted appliances in the way you should. It will do no harm to check down on this for it may be your crew don't think you are honestly sold yourself. How 'bout it?

IF I were the manager of a gas property selling mechandise I would instruct the man who wrote my advertisements to scratch the big sale stuff and comparative prices from his book of tricks. Women, and they purchase the larger percent of home appliances, are prone to put a little salt on sales stuff and comparative prices these days. Do not forget that woman is the logical purchasing agent and as such knows current values and prices.

GAS... a Convenience in 15 Million Kitchens
Are you using Gas? With SKELGAS you can have NATURAL GAS anywhere
SKELGAS
The COMPRESSED NATURAL GAS
RADIO
SKELLY OIL COMPANY

Skelgas Goes to the Country

HYLAND PIPER

HERE is an advertisement which drives home the convenience of gas as a fuel for domestic cooking. It is one that is well worthy of a little study by gas men at large. These advertisements which were published in newspapers of the middle west attracted a great deal of attention and it would seem, from the comments of housewives, that in many instances they are really "saving the day" for gas as a cooking agent.

Coming, as it has, at a time when a great many city dwellers seek the quiet and the pure air of the suburbs, "bottled natural gas" will doubtless further speed up this movement. It will certainly enable many people who dwell in the cities to move to the country; people who have heretofore been reluctant about doing so on account of the fact that they would have to sacrifice some of the necessary conveniences they enjoy in the cities. The matter of a convenient as well as economical heating and cooking fuel is always of paramount importance.

"Bottled Gas" solves this great problem and at a cost that is considered very reasonable. Aside from enabling the urban dweller to live in the country, this new gas is making it possible for rural dwellers and the people of the smaller cities to enjoy the convenience of its use and to become acquainted with the many advantages of gas as a carefree cooking, drying and heating agency. It is not only lightening the daily labors of the women in small towns and rural communities, but it is educating the coming generations to the true value of gas service. It is actually building customers for the city manufacturing and distributing companies because it is performing all the educational work at the very source of the supply, so to speak, of future city dwellers.

BOOK REVIEW

Asphalts and Allied Substances, *by Herbert Abraham.* Third Edition. D. Van Nostrand Company, Inc., New York. 891 pages. Price, $10.

To those coke and gas-works men who are interested in tar refining and tar products this volume on asphalts will be a valuable reference work. At the present time there is an intimate interrelation between road oils, road tars, and waterproofing materials made from water-gas tar and coal tars and the analogous materials usually classed as asphalts. It is essential, therefore, that those seeking to market tar or to process it should acquaint themselves with the trend and the technology in the field of natural asphalts and petroleum products which fall into the great group of artificial asphalts. This volume, in its third edition, represents a splendid means for making that acquaintance with the parallel field.

Coal Carbonization *by R. Wigginton.* Baillière, Tindall and Cox, London 1929. 287 pages. Price, 21s. net.

The author of this volume states that he has compiled the present work having as his main object the desire "to give an outline of the chemistry of coal carbonization, as far as it is at present understood, from an academic rather than from a technical standpoint." In this purpose he has succeeded admirably. The volume brings together in concise arrangement much of the fundamental theory and discussion of the industrial and scientific literature. Moreover, the author succeeds rather well in tying together some of the empiric phenomena exhibited in the action of heat on coal with other investigations as to the inherent structure and composition of coal and the composition of the major products formed therefrom.

The author has adhered very closely to his desire to keep the book on an academic rather than an industrial basis. There is a very short chapter describing some of the more common coke-oven and retort structures, with brief mention of two or three of the best known low-temperature process plants. The engineer should, however, not expect that the balance of the work will have direct industrial value to him in the operation or design of coal treating plants. The value of the book lies rather in the field of the research chemist who is seeking to interpret the reactions in terms of better products and higher yields. For such a laboratory worker the volume will serve as a convenient resume of a great deal of the existing literature. It will also afford a number of points in the discussion at which one may anticipate warm controversy because of sharp differences in opinion between readers and author. This, however, does not militate against the usefulness of the book for that class of investigators for which it is intended.

More Evidence

The picture shown above is that of our Ten Million cubic foot holder erected at Long Beach, California. This is a duplicate of our Ten Million cubic foot holder erected at Buffalo, N. Y. Another holder of same capacity has just been completed in San Francisco, California.

FURTHER evidence of Stacey Bros. "Ability to Serve" is shown in the Ten Million cubic foot capacity gas holder recently completed in San Francisco, California.

This mammoth holder is built along the precise lines, and of the same capacity as the one illustrated here, (erected at Long Beach, California,) and the one at Buffalo, N. Y.

All three of these Stacey Bros. holders have won for us universal praise for the unprecedented rapidity with which they were erected, for the workmanship and the methods employed; which substantiates our claim to preeminence in this specialized field.

It is the confidence the gas industry has placed in Stacey Bros. prestige as the Pioneer Gas Holder Builders of America, that proves undisputably our

"Ability to Serve"

Cleveland Gas Meters have a reputation for dependable service, the result of over thirty years' experience in manufacturing.

Our thoroughly organized and completely equipped factory assure you that the workmanship, materials, accuracy and general efficiency are unequaled.

"A" Type Meters "B" Type Meters

THE CLEVELAND GAS METER COMPANY

2168-2180 East 65th Street Cleveland. Ohio

Seventy-three years!

Almost three quarters of a century of manufacturing experience is behind every Mueller product.

Much of that seventy-three years has been patient schooling—combining the knowledge of hundreds of skilled men working to improve every piece of Mueller plumbing, water, and gas brass goods released to public use.

The result is as you might expect—gas stops made of the highest quality materials providing the maximum of scientifically placed strength. Most accurate precision methods of manufacture—the most severe inspections—all used to their utmost to provide the greatest amount of service with the least amount of trouble.

The complete Mueller line of gas stops includes flat, tee square and socket head with or without check, as well as with Minneapolis top and with lock wings.

Through strict laboratory control of each furnace heat, a metal with much higher tensile strength and elasticity is produced than is possible even with the same composition under ordinary furnacing.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches:* New York, Dallas, Atlanta, San Francisco, Los Angeles, Chicago; *Canadian Factory:* MUELLER, Limited, Sarnia.

Mueller Flat Head Service Stop, G-11026

Mueller Flat Head Service Stop, G-11007

MUELLER

Service Stops

IF you still question the economy of a manufactured-gas-driven engine — get the performance records on Type-19! In two kinds of manufactured gas distribution service, this quick-starting, dependable unit is proving itself to be the most economical type of prime mover: [1] For high-pressure transmission where the load factor is low; [2] For stand-by duty. Ask for records on compressor or rotary blower drive.

THE COOPER-BESSEMER CORPORATION
Formerly The C. & G. Cooper Co. and The Bessemer Gas Engine Co.
Mount Vernon, Ohio Grove City, Pennsylvania
Branch offices in all principal cities

COOPER-BESSEMER

New Orleans the Scene of A Successful Natural Gas Meeting

IT SEEMS peculiarly fitting that the Meeting of the Natural Gas Department of the American Gas Association should have convened this year in New Orleans. Obviously, there is some close relation, at least from an inspirational standpoint, between the "city that care forgot" and this supremely carefree fuel.

To say that the meeting was a decided success is to tell the story only in part. The program committee did a fine piece of work in lining up perhaps the best group of papers and addresses ever presented at a Natural Gas gathering. Further, the large number of both Natural Gas as well as Manufactured Gas men present gave evidence of the increasing importance of Natural Gas in fuel and heating affairs throughout the nation.

As would be expected of New Orleans, the city did itself proud in providing entertainment that was just about the last word.

A large and representative audience greeted Chairman H. C. Morris on the opening day and his address gave proof of the fact that the Natural Gas Industry is going ahead full speed on "an even keel" and gives promise of more than fulfilling its aims and aspirations. Mr. Morris's address was enthusiastically applauded.

H. C. Morris

Chairman, Natural Gas Department, American Gas Association

Address by Mullaney

B. J. Mullaney, President, American Gas Association, delivered his usual meaty and well thought out ideas relative to the needs of the Gas Industry in general, after which Major Forward, Managing Director, American Gas Association outlined the good work that is going on at Association headquarters.

In his paper, "Promoting Natural Gas Sales," Mr. F. M. Rosenkrans spoke of a number of ways whereby the sales of Natural Gas can be increased. He was followed by Mr. H. J. Hoover who handled the "wrinkles."

Mr. R. W. Gallagher, who has been so instrumental in placing the Appliance Testing Laboratory in Cleveland on its present high plane, forcibly presented the need for amassing pertinent and workable statistics relative to Natural Gas. His paper was titled, "Collecting Natural Gas Statistics."

After discussing the Natural Gas Fellowships, Mr. J. B. Tonkin was followed by Mr. W. S. Yard who read a paper "Natural Gas Developments on the Pacific Coast." Mr. Yard stated that 65% of California's consumers are now using Natural Gas and this shortly would be increased to 95%. He touched upon the significence of the transportation of Natural Gas from the Kettleman field to San Francisco and vicinity. He also mentioned the need for imparting an odor to this gas.

The growing use of "bottled gas" in California was emphasized by Mr. Yard who stated that 12,000 consumers are using this fuel.

One interesting new use for Natural Gas was mentioned by the speaker, namely; the drying of kelp or seaweed for use as livestock feed. The state's Natural Gas Statistics were quoted by Mr. Yard and are given below.

California Natural Gas Statistics for Month of January, 1930

Field	Production	Repressuring and Storage	Sold to Gas Companies	Wasted to Atmosphere
Huntington Beach	1,098,000*	64,000	239,000	16,000
Long Beach	7,456,000	0	2,410,000	1,284,000
Santa Fe Springs	18,749,000	250,000	2,367,000	12,096,000
Ventura	5,545,000	0	3,533,000	775,000
Kettleman Hills	10,868,000	23,000	2,228,000	7,789,000
Midway-Sunset	2,152,000	51,000	777,000	168,000
30 Other Fields	744,000	0	133,000	436,000
Total	46,612,000	388,000	11,687,000	22,564,000
Daily Average	1,500,000	12,500	377,000	728,000

*All figures are in thousands of cubic feet.

"Our Main Technical and Research Committee" was taken care of by Mr. H. C. Cooper, Hope Natural Gas Company, this being followed by a paper, "Gas Measurement," by Mr. T. R. Weymouth, of the Oklahoma Natural Gas Corporation. Then followed the papers, "Pipe Line Flow" and "Gas Well Delivery Capacities," by Mr. H. D. Hancock, Henry L. Doherty and Company, and Mr. N. C. McGowen, Louisiana Gas and Fuel Company respectively.

In his paper, "Leak Detection and Prevention in Congested Cities," Dr. J. B. Garner, Peoples Natural Gas Company, outlined the program his company had followed in Pittsburgh for finding gas leakage. He summarized this work as follows:

"1st. Approximately 8,000 samples have been collected in the Greater Pittsburgh District. Some samples have shown a content of more than 10 percent carbon dioxide. Special attention has been given to street openings, the atmosphere of which might be contaminated with gasoline vapors from crankcase oil, naphtha from cleaning establishments, vapors of benzol from by-product plants, and alcohol mashes from illicit distilling plants.

Many Samples Taken

"2nd. Approximately 115,000 street openings have been inspected in the Greater Pittsburgh District from July 28th, 1928 to March 20th, 1930.

"In 106 working days a crew of four men has taken 2,243 samples and inspected 40,967 street openings. On one large system inspecting and prospecting tests have been made, as outlined herein, with the following results.
Consumers' premises—20,193;
Leaks located thereon—1,844;
Curb box inspections—116,700;
Leaks found—2,204;
Leaks repaired as result of inspection of street openings—1,144.

"3rd. From November 1st. 1928 to October 31st, 1929, a total of 3,260 major repairs were made in the Pittsburgh District

"4th. In the Greater Pittsburgh District large quantities of blast furnace slag have been used as backfill either above or completely surrounding natural gas pipe lines. There has therefore been ample opportunity to learn the effect of such backfills on natural gas lines. Positive evidence of the corrosive action of slag on iron pipe, steel pipe, and lead caulking, has been found. The use of slag as a backfill directly over and around lines complicates and increases the likelihood of gas leakage from transmission and distribution lines, thus making a great hazard

to life and to property therefrom. A study of the physical and chemical properties of slag on the one hand and of conditions as they exist underground in and around lines on the other hand amply justify this conclusion."

Wednesday's session was opened with a paper, "Pipe Protection," by Mr. George Wehrle of Denver. He discussed the work and research being carried out to cut corrosion to a minimum. He advanced an interesting theory which is quoted:

"Might it not be possible that the material of which pipe is now made is not what it should be? I do not mean by this that iron should necessarily not be the base element used. Vastly more difficult problems have been met and solved than the provision of an iron pipe having all of the required characteristiccs ot the present steel pipe and still be highly resistant or impervious to corrosion. This immediately brings to mind the various alloys of steel sold under certain trade names as non-corrosive pipe and which are now under test by the Bureau of Standards in various soils throughout the country. I do not know if our "waterproof" pipe of the future will be an alloy of steel or if it will be a steel pipe impregnated or saturated with something to make it resistant to corrosion. I do not even know if it will be steel at all. Perhaps it may be asbestos, or some similar material compressed to the necessary tensile strength. I do know, however, that it must be cheap, relatively, or we cannot afford to use it."

Gas Refrigeration

In discussing "Building Domestic Load by Selling Appliances," Mr. W. J. MacIntyre, Southern Cities Distributing Company, said in part:

"It is important that we recognize and accept gas refrigeration for the reason that its perfection and practicability represents the opening wedge to that use of natural gas which may, in whole or in part, offset the house heating peak. House cooling has already been subject to discussion in committee meetings of this organization and at the present time our Company is experimenting along this line with the hope that they may be able to materially assist in transforming house cooling from a dream to an actuality. From studies made to date it is impossible to predict the ultimate limits of this possible load or just how broad a field it will have in practical commercial application. However we do have this factor to consider in its favor—the American people are always willing to accept and pay for any new and modern trends leading to improved living conditions. We recognize this use of gas as our opportunity to not only increase domestic consumption but to offset the terrific peak of four and a half month's heating load. You may well appreciate that we take house cooling seriously when it is explained that our average yearly consumptiou per consumer is one hundred M. C. F. and that seventy per cent of this load is delivered within this four and a half month period. Filling in the valley representing summer load conditions, wholly or in part, by means of gas refrigeration and house cooling, is recognized by us as our opportunity to increase domestic load and stabilize our business."

Dr. J. A. Shaw of the Louisiana State Department of Conservation outlined the steps that are being taken to conserve Natural Gas. His paper was "Conservation in Louisiana."

Competitive Influences

The only paper to be read by a woman was "The Value of Home Service," by Miss A. Berry, San Antonio Public Service Company. Miss Berry in speaking of the competition offered by extraneous matters said: "The tendency of today toward outside interests and outside amusement is rapidly taking the place of home activity to a great extent. You already know that, but let's apply it to our own industry. Breakfast in most homes is a small item if prepared at all, though by no means is that a credit to us or an aid to our energy output or digestion; the husband and father has his lunch downtown while the mother eats at home quite hurriedly because it's "too much trouble to prepare lunch for one;" the children have lunch in the school cafeteria; dinner is most likely eaten downtown by all members of the family or they may entertain. If a dinner is to be served a group of people in a home there are in a great many places caterers who make a specialty of serving dinners in the home, furnishing table, dishes, silver, waiters, etc., and at a very nominal price. Then there is also the mushroom growth at this time of year of hamburger and hot-dog stands not to speak of the dozens of out-of-door eating places springing into existence in almost every town, all of which call people away from home to eat. I was much amused the other evening to hear Floyd Gibbons remark over the radio that there promises to be a bumper crop of hot-dog and hamburger stands in the section of the country through which he had been traveling. That seems to be the case almost everywhere, I think. All of these are pulling constantly against the preparation of food in the home."

Favorable Public Relations

"The necessity of favorable public relations and continuous activities within every company that tend to create favorable businesslike impressions is paramount to-day," said Mr. R. E. Haas of the Columbia Gas and Electric Corporation. "On every hand in every State there are outside influences at work—some latent, some active—which are aimed at the very foundation of the utilities. What a prominent writer said recently about the manufactured gas industry holds true for the natural gas industry and the entire public utility industry;—"My advice to the (gas) industry is to push ahead more determinedly than ever before and not to let any lessening in general business serve as a signal for timidity along the lines of public relations in which such excellent work has been done during the last few years. The cumulative effect of five years' public relations work can drop swiftly from sight if the steady educational drive on the public is abandoned or lessened for even a short length of time."

In concluding his paper, "The Study of Gas Fields," Mr. E. L. Rawlins, Natural gas Engineer, U. S. Bureau of Mines, had the following to say:

"It has not been possible, with the present progress of the study of gas-well gauging, to give a complete and detailed discussion of gas fields, especially in regard to the availability of gas. The many variations in operating conditions and in the actual fundamental differences in the different fields needs further intensive study. An attempt has been made, however, to bring possibilities that can be considered to the attention of those engaged in the natural-gas industry. The open-flow committee of the natural gas department of the American Gas Association now has a problem which, if broadened and studied carefully and intensively, should give valuable information regarding all phases of natural-gas production. The fundamentals of actually gauging gas-well capacities not only to determine production under "open flow" conditions but under any conditions of pressures will apply to such problems as the availability of gas, storage of gas in depleted sands, control of gas wells, estimation of gas reserves, and to many other problems that are important in the natural-gas industry. With these possibilities this committee should obtain very valuable results by a more intensive study of individual gas wells, gas fields, and gas-producing areas and then coordinating all of these data to form a basis upon which to make general recommendations for general operating conditions."

Paper by W. M. Little

In his paper, "Development and Load Characteristics of Large Volume Industrial Sales," Mr. W. M. Little, Chief Industrial Sales Engineer, Cities Service Gas Company, said, "the industrial man should be thoroughly familiar with the sources of gas supply connected to his pipeline system and should be familiar with the capacities of his system at different points, as well as the quality of gas which is being delivered. He should know, also, something about meter measurement, both orifice and positive, and should be thoroughly familiar with the problems involved in the proper utilization of gas in the industrial plants which he is serving and proposes to serve. We are ever being confronted with new problems in the natural gas industry in the utilization field as well as other phases and the industrial man must be ever alert to increase his knowledge of all such improvements."

Regarding competition he stated that, "we have found that where we have to compete with fuel oil, it is not very diffi-

cult to secure contracts, but on the other hand, the enormous growth of the natural gas business has no doubt been one of the chief causes of the price reduction of steam coal and it is kicking back on the natural gas companies two-fold."

The open forum presided over by Mr. J. D. Creveling handled the following topics under the respective discussion leaders: "Handling Water in Wells," J. H. Dunn, Lone Star Gas Company, "Recent Progress in the Saturation of Natural Gas with Oil and Water," H. L. Gaidry, New Orleans Public Service, Inc., "The Relative Advantages of Displacement and Orifice Meters," George B. Sheppard, United Gas Co., "How to Build Up Load in Southern Climates with a Large Percentage of Colored or Foreign Population," L. E. Vogelsang, San Antonio Public Service Co., "Selling Gas for Househeating with Straight Gas and Couversion Units," J. J. Brennan, Memphis Power & Light Co.

The concluding papers were "A Uniform Classification of Accounts," by E. N. Watkins, Arkansas Natural Gas Corporation, and "Application of Degree Day Deficiency to Computing Domestic and Heating Loads," by R. M. Redding, Dallas Gas Company. This latter paper is somewhat fully abstracted below.

Application of Degree Day Deficiency to Computing Domestic and Heating Loads

R. M. REDDING

General Superintendent, Dallas Gas Company, Dallas, Tex.

FOR 20 years Dallas, both Metropolitan and Suburban, has used natural gas. At the present time this fuel for domestic purposes is looked upon as a necessity equal to water. A survey made last July shows that 99% of the total domestic fuel requirement for cooking, hot water and heat for the 315,000 population in the area served is supplied by natural gas. Compared with the survey of the Real Estate Board, which is made each year, the number of active meters is 101% of the indicated requirement to serve all domiciles, warehouses, stores, etc., in the City—hence, we may feel justified in the conclusion that sales volumes and other operative data taken in a City of 99% saturated as to domestic demand are a reasonably accurate measure of present day sales possibility.

To those charged with the advance estimating of sales in both old and new territory perhaps the most perplexing phase of the problem is that of determining how much gas will be used for space heating. We may think this a problem of recent development, however such is not the case. It may be that the much used term Degree Day Deficiency is of recent coinage, but the attempt to develop a definite measure of the relation between temperature and fuel requirement dates back many years. An old edition of the "Ideal Fitter" now out of print carries two curves showing the amount of coal that will be required in Chicago and in Detroit per sq. ft. of radiation per heating season. These curves show that if the number of hours during which heat is required be multiplied by the maximum demand and this product by .33, the result will be the season's fuel requirement. This it will be noted, is only a variation of the Degree Day method of compilation.

Coming back to the question of development of a measure of gas fuel requirement for domestic use, other than cooking and hot water, there is submitted herewith as Exhibit (1) an analysis of domestic rate sales in Dallas for the past six years. It will be noted that an operative year from June 1, to June 1, is used. This is for the purpose of getting as nearly accurate periodic sales figures as the operation of the Company will permit. This operative year is divided into two periods of five and seven months respectively. The seven month period—November to May inc., being that part of the year in which gas used for space heating purposes may appear in the billing.

EXHIBIT I.

DALLAS DOMESTIC RATE SALES

June to June Year — Split into (1) Period of no heat requirement. (2) Period of space heat demand registration. All figures in cubic feet and are average sale per active meter.

	Cu. Ft. 1923-1924	Cu. Ft. 1924-1925	Cu. Ft. 1925-1926	Cu. Ft. 1926-1927	Cu. Ft. 1927-1928	Cu. Ft. 1928-1929	Six Year Average
May							
June	15,570	14,610	14,190	14,200	14,700	14,910	14,710
(1) June-October	70,100	59,980	60,410	61,450	63,560	68,970	65,250
(2) November-May							
Year	85,670	74,590	82,600	75,760	77,260	83,880	79,960

ANALYSIS OF HEATING SEASON SALES (November-May)

TOTAL	70,100	59,980	60,410	61,450	62,560	68,970	65,250
Less Average Sale Per Meter to Commercial Paying Domestic Rate	4,740	4,060	4,620	4,900	4,230	4,640	4,380
Less Allowance of 110 Cu. Ft. Per Day For Cooking and Hot Water	23,320	23,320	23,320	23,320	23,320	23,320	23,320
Remainder is Chargeable to Space Heating Demand	42,040	32,600	41,010	34,160	35,010	41,010	37,550
Degree Day Deficiency	2,612	2,004	2,583	2,106	2,192	2,573	2,341
Cubic Feet of 1000 B. T. U. Gas Required Per Degree Day Per Meter (In addition to Requirements for Cooking and Hot Water)	16.20	16.30	16.00	16.20	16.00	15.95	16.04

Definite Starting Point

The second section of the Exhibit (1) is an analysis of the sales per meter during this seven month period in which heat registration may appear. In the break down of this volume of sale it will be evident that we are starting with a definite known average sale per meter. However, the deduction for commercial paying domestic rate, as well as the deduction for cooking and hot water use, are estimates and must of necessity be so, due to the fact that the registration for all domestic rate service in the home is thru one meter. With respect to the first deduction, namely commercial paying domestic rate, an analysis of one year was made and resulted in a value equal to 6½%of the total domestic rate sale. A further survey of the six years under consideration develops that if 50,000 cu. ft. per month be taken as a dividing line between pure domestic rate service and commercial and industrial paying domestic rate, the minimum percentage was 6% and the maximum 7%. Therefore, for the purposes of this analysis 6¾% of the gross domestic rate sale is deducted for commercial and industrial use paying domestic rate.

The second deduction is that for cooking and hot water. This allowance is supported by operating figures for May and October, which months are average for the year, but somewhat lower in hot water requirements than the winter months, and taking into consideration the fact that 65¾ of meters carry a hot water installation freely used during winter period. Subtraction of these two items from the total registration leaves a quantity chargeable to space heating.

If there be a definite relation betwen space heating demand and temperature the equation should show a constant per unit of heat demand from year to year. Division of the annual Degree Day Deficiency into the quantities of gas chargeable to space heating gives a surprisingly uniform value for this constant. As will be noted in the tabulation this value is 16 cu. ft. with a plus and minus tolerance of less than 2%.

Presented at Meeting of Natural Gas Dept. A. G. A., Apr. 5-8, 1930, New Orleans.

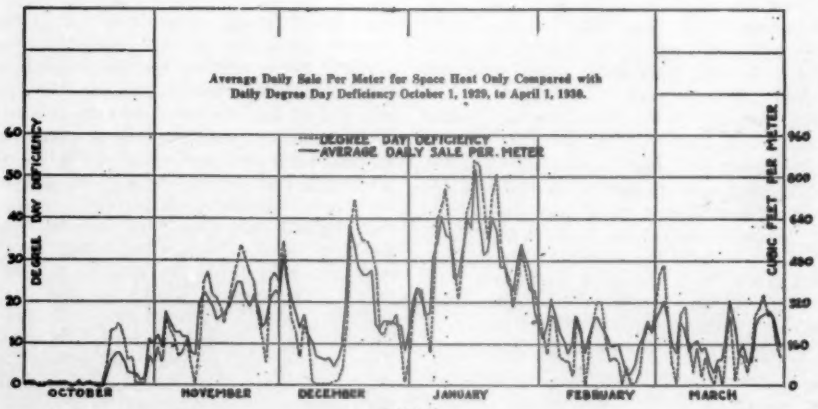


Exhibit II

In so far as Dallas and North Texas are concerned this unit value has been verified on mass operation up to 300,000 meters.

In the tabulation which I have just been discussing the time unit has been the overall heating season, or approximately six months. We believe that dealing in time units smaller than the heating season is inadvisable. The question naturally arises as to how sensitive is the relation that exists between temperature and fuel requirement for heating. To answer this a graph has been made up covering the daily mean temperature and the actual daily delivered sales for space heating, covering the period from October 1, 1929 to April 1, 1930 and on a City wide basis. (See Exhibit II)

The degree days are from the Local Weather Bureau. Daily volumes of gas used for space heating were determined by deducting from City gate delivery (1) Unaccounted-For (2) Industrial Sales (3) Commercial paying domestic rate and (4) Allotment to cooking and hot water. The daily residual being space heating sales. This daily remainder divided by the number of active domestic motors on that day gives the actual delivery per meter for space heating (in addition to that used for cooking and hot water).

If the ratio of 16 cu. ft. per meter per Degree Day Deficiency be correct then a plotting of the actual sale per meter against the D. D. curve and on a ratio of sixteen to one should superimpose the the sales curve upon the temperature curve.

Reference to Exhibit II, will show that this definite relation exists and that such relation follows with reasonable sensitivity when one considers that no weight is given to several possible minor variables that may affect volume of use in some degree.

A planimeter reading of those two curves gives a volume ratio of 146 to 147 for the elapsed time—October 1, to April 1.

Exhibit III, is offered as record of the gradual stabilizing of sale on a per capita basis. Generally, sales actual and potential are based on a "per meter basis". Obviously this is not a measure of saturation. The limit of sales must be considered as that volume which registers 100% of the domestic rate fuel requirement of the total population in the area served. Hence the desirability of measuring possible sales by a per capita yard stick.

The per capita value of this unit is the present day total demand and is not influenced by price variation so long as the price charged is within the economic limitations of competition. In support of this statement your attention is called to Exhibit III, and to Exhibit IV. You will note that the per capita use has increased during the past ten years in the face of substantial increases in dollar cost and in gold dollar purchase value rate. Graphically this relation between use and cost both actual and relative is shown in Exhibit IV.

It will be observed Dallas seems to be stabilized on a value of about 14800 cu. ft.

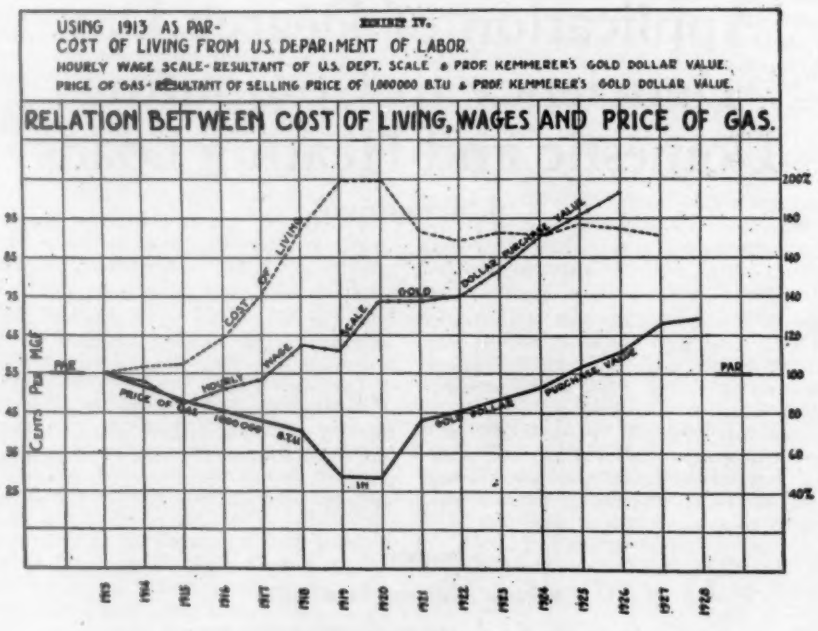


Exhibit IV

EXHIBIT III.

DALLAS DOMESTIC RATE SALE DATA

Year	Population Served	Annual Dom. Rate Sales M. Cu. Ft.	Sales Per Capita Cu. Ft.	D. G. Co. Avg. Sale Price Per M. Cu. Ft.	Gold Dollar Purchase Value Rate in Cents Per M.
1920	(a) 204,000	2,576,280	12,600	49.4c	(b) 29.
1921	206,000	2,650,481	12,850	48.6	43.
1922	222,000	3,102,783	13,900	48.6	46.
1923	229,000	3,429,026	14,960	48.6	49.
1924	256,000	3,736,632	14,600	48.6	52.
1925	272,000	3,967,815	14,600	70.5	57.
1926	288,000	4,441,353	15,300	72.2	61.
1927	299,000	4,158,754	13,900	76.5	68.
1928	310,000	4,563,261	15,000	75.5	70.

NOTE—(a) Population figures, census and Worley's Directory.
(b) Based on Prof. Kemmerer's curve for value of gold dollar taking 1913 as par.

per capita per year for domestic rate use. This being the average of the last five years reported. The variable is space heat requirement and has a range of 1800 cu. ft. between minimum and maximum years.

As will be inferred I have been leading up to the establishment of a measure of Pure Domestic requirement on a per capita basis. To secure the necessary unit to permit the expressing of this value as an equation, the Domestic Rate Sale over a five year period is again handled somewhat differently in order to reach the heat requirement on a per capita basis. This analysis of sales will be found in tabulation five and for purely domestic use develops a value of 3.3 cu. ft. per Degree Day per capita for space heat only.

With this value we may now set up an equation to be used in calculating possible Domestic Sales (exclusive of commercial paying domestic rate) on a per capita basis and for a given area.

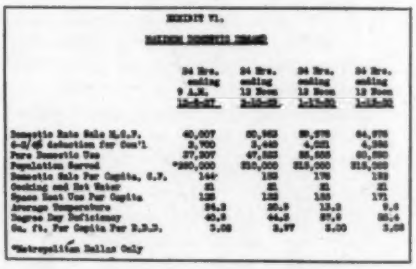
Population

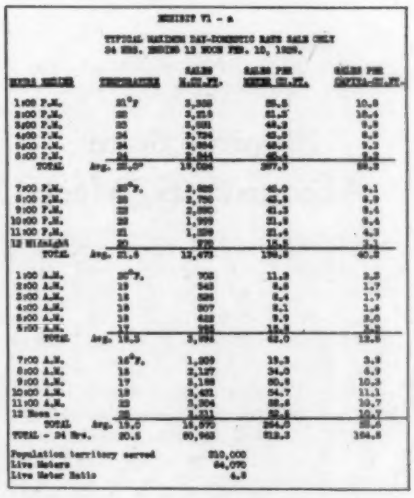
[6780 + (degree day deficiency) 3.3] = Annual Domestic requirement in cubic feet of 1000 B. T. U. gas.

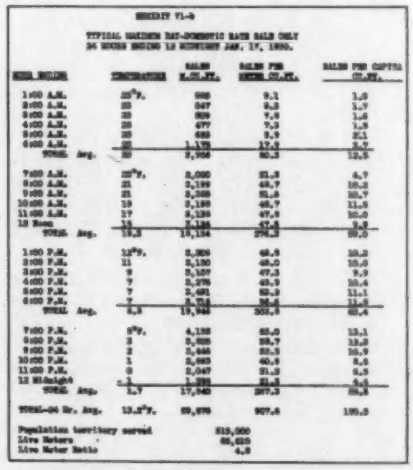
EXHIBIT V.

	Year Ending June 1, 1925	June 1, 1926	June 1, 1927	June 1, 1928	June 1, 1929
Total Dom. Rate Sale—M.C.F.	3,648,825	4,445,685	4,177,660	4,532,827	5,349,623
Deduction 6⅔% for Com'l Use	246,242	300,084	281,992	305,946	353,742
Pure Dom. Sale	3,401,783	4,145,601	3,895,668	4,226,881	4,995,891
Population	254,000	272,000	288,000	298,000	315,000
Dom. Use Per Capita	13,350C.F.	15,200	13,500	14,189	15,458
Cooking & Hot Water Use * Per Capita	6,780C.F.	6,780	6,780	6,780	6,780
Space Heat Use Per Capita	6,470	8,420	6,720	7,320	8,670
Degree Day Deficiency	2,994	2,558	2,186	2,192	2,573
Heat Requirement per D.D.D. Per Capita	2.22	3.35	3.19	3.34	3.35
					Avg. 3.3

County Gas Company with approximately 30,000 meters in residential territory and with practically no Com'l Sales taking domestic rate has a five year average domestic use for May to October period, of 12,425 cu. ft. per meter. For the other seven month period a value of 23,320 cu. ft. has been used, making an annual use of 35,745 cu. ft. The population ratio to live meters for the past five years is 5.2 This gives a per capita requirement of 6,780 cu. ft. for domestic cooking and hot water.



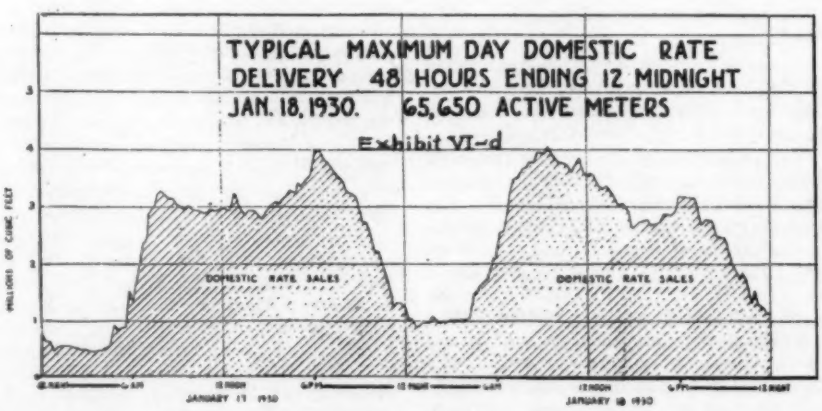




As a companion of this equation it will be desirable, if possible, to establish a means of calculating the saturated maximum day demand for domestic use only, and under conditions of continuous heating during low temperatures. To do this we will need a per capita per day value for cooking and hot water. Heretofore 23,320 cu. ft. has been used as the requirement per meter for the seven months November to May inclusive. Also a population to meter ratio of 5.2. Therefore:

$$\frac{23.320}{212 \times 5.2} = \textit{per capita per day during winter months} = \textit{21 cu. ft. for cooking and hot water.}$$

Available also are detailed records of four days of maximum demand during the past three years. This data is given in Exhibit VI. Analysis of these maximum day sales gives a value of 3 cu. ft. per Degree Day per capita for space heat



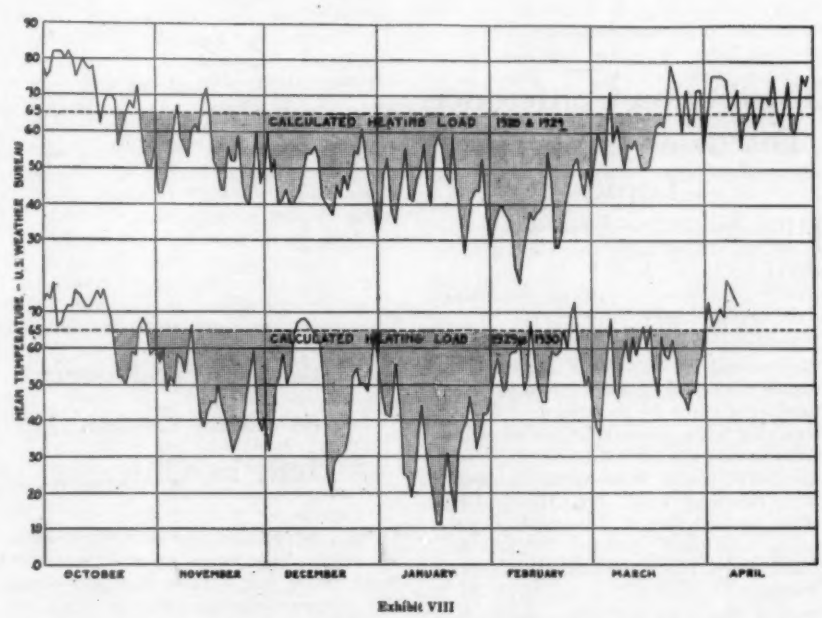


Exhibit VIII

only under conditions of continuous heating, and where gas used for cooking also materially assists in supplying required heat. For domestic sales only, and not including such gas as may be used for commercial and industrial purposes but paying the domestic rate, we may write the equation:

Maximum day domestic demand = Pop. [21 + (D. D. D.) 3]

Supplementing the foregoing analysis of Domestic Rate Sales and illustrating some of the load characteristics of Domestic Rate service in climatic conditions comparable with North Texas, Exhibits VIa, VIb, VIc and VId are included. VIa-b-c being hourly records of temperature and Domestic Rate Sales in bulk and on a per capita basis.

VId is a curve of the deliveries for Domestic Rate purposes during the 48 hour period ending Midnight January 18, 1930, and is a plotting of the sales shown in VI b-c.

Attention is called to the uniformity of the load periods of low temperature. The load factor for this particular 48 hour period being about 80%.

VIa represents maximum day Domestic Rate Sales in 1928-29 heating season. The total Domestic Rate Sales for this heating season was 4,362,743 M. Cu. Ft. equivalent to a seasonal load factor of 40%; and an annual factor of 28% based on 5,240,633 M. Cu. Ft. Domestic Rate Sales for 12 months ending May 31, 1929.

Exhibits VII and VIII illustrate some of the Commercial applications of the use of D. D. D. calculations in the handling of customer's complaints of high bills.

Distribution Conference Discusses Important Topics

THE Annual Distribution Conference of the American Gas Association, held at St. Louis, April 9-11th., covered a number of topics of extreme importance to the Gas Industry.

"Training School for Gas Fitters," was a paper read by Mr. W. J. Buckley, The Peoples Gas and Coke Company, which showed the value of the educated fitter in promoting better public relations as well as outlining a scheme for conducting such educational work. Also, along the line of public relations work Mr. Harry Ellis, Public Service Gas & Electric Company, read a fine paper entitled, "Public Relations from the Distribution Engineer's Viewpoint."

"Shop Practice and Customers' Service," by Thomas J. Perry, The Brooklyn Union Gas Company, outlined the method of setting up the proper shop practice in order to insure the customer getting the best service possible.

The "Report of Sub-committee on Economics of High Pressure Transmission of Gas," Geo. A. S. Cooper, Chairman, was replete with graphs and calculations on the cost of transmitting gas at various pressures. It forms a valuable addition to this phase of gas literature.

The Report of Committee on Pipe Materials," M. I. Mix, Chairman, dealt with the various kinds of pipe and their adaptability to the different uses.

Mr. I. D. vonMaur, Consumers Gas Co. of Toronto, read an interesting paper, "A Theory Suggested as a Partial Explanation of Why Leaks Occur on Cast Iron, Bell and Spigot Joints Made with Lead." He brought out the thought that perhaps the settlement of the spigot end brings additional weight on the yarn and lead and further settlement gives rise to leakage. This would tend to make the lead more compact in the bottom of the joint and at the same time the top of the spigot would tend to leave the lead. This would seem to lead to more leaks at the top than at the bottom of the joint. Mr. vonMaur stated that this contention has been borne out in a great number of actually observed cases. He compared this theory with the vibration and other theories and the conclusions seemed to favor his theory. He advised Distribution men to carefully note in what part of the joint a particular leak occurred and thus in a few years much valuable data would be in hand.

Other papers were as follows: "Report of Sub-committee on Meters," W. H. Bettle, Public Service Electric & Gas Company, Chairman, "Design of Distribution Buildings," Charles F. Morris, Public Service Company of Colorado, Denver. "Progress Report of Subcommittee on Distribution System," C. S. Goldsmith, The Brooklyn Union Gas Company, Chairman, "Report of Committee on Plain End Fittings," M. I. Mix, The Peoples Gas Light & Coke Company, Chairman, "Correlation of Certain Soil Characteristics with Pipe Line Corrosion," I. A. Denison, U. S. Bureau of Standards, and "Soil Action on Pipe-Line Coatings and Its Bearing on the Corrosion Research of the American Petroleum Institute," Gordon N. Scott, U. S. Bureau of Standards.

Mid-West Industrial Gas Sales Council Held in Chicago

THE meeting of the Mid-West Industrial Gas Sales Council was held April 18, at the Palmer House, Chicago. The program was as follows:

I. "Control Equipment"—discussion to be led by O. M. Olson, Eclipse Fuel Engineering Company, Rockford, Illinois.
   1. Actual results such as saving in fuel and increased or improved production.
   2. Type of equipment best suited to certain applications, taking into consideration control limits and price of equipment.
   3. Automatic control equipment from the standpoint of sales argument.

II. "Application of Gas to Neighborhood and Small Wholesale Bakeries"—discussion to be led by T. J. Gallagher, peoples Gas Light and Coke Company, Chicago; A. A. Schuertz, Milwaukee Gas Light Company, Milwaukee, Wisconsin; and S. B. Lee, Central Public Service Company, Rockford, Illinois.
   1. Basis on which present installations were sold.
   2. Type of oven and conversion burner equipment used with comparisons of different types and necessary changes in oven construction.
   3. Rate and rate structure necessary to get this business.
   4. Measures taken to hold the load.

III. "Continuous Vitreous Enameling with Particular Reference to Cost of Gas as Compared to Electricity"—discussion to be led by C. F. Henness, Public Service Company of Northern Illinois, Chicago.

Empire State Accountants Meet

ONE hundred and thirty accounting executives, statisticians and other office employees attended the two day session of the Accounting Section of the Empire State Gas and Electric Association at Briarcliff Lodge.

Morris Tracy of the Empire Gas & Electric Company at Geneva, chairman of the section, presided on the first day with J. R. Malone of the New York and Queens Electric Light & Power Co., vice chairman, presiding on the second.

The new officers elected were J. R. Malone, of the New York & Queens Electric Light & Power Co., as the new chairman, and F. J. Brett, of the Buffalo, Niagara & Eastern Power Corp., as vice chairman.

E. H. Rosenquest, president of the Westchester Lighting Co., welcomed the meeting and reviewed the evolution of the gas and electric industry in the past five years and expressed great hope for its continued success under proper regulation.

C. E. Eble, of the Consolidated Gas Company spoke on Mechanical Operation of Accounts Payable. Ways and means of coordinating the work of the accounting treasury and auditing departments for a steady flow of work to the machine were given by the speaker.

J. J. Ward, of the Associated Gas & Electric System, reported as chairman of a committee on Taxation Records. He pointed out that in New York State there are twenty-seven distinct taxes which directly or indirectly affect the accounts

of public utilities. Nine of the most important of these were carefully analyzed and the material necessary for the recording of these were described by the committee chairman.

H. H. Judson, of the New York Edison Company, spoke on Accident Prevention and the account's important position in furnishing records of accident costs.

Randall J. LeBoeuf, Jr., general counsel of the Niagara Hudson Power Corporation, addressed the meeting on the Public Service Commission and the Accounting Practices of Public Utility Corporations. He pointed out that courts, commissions and companies alike have recognized that uniform systems of accounts and a degree of control over accounting methods are essential to proper commission regulation. The authority of commissions over the methods of computation and the amounts of all charges to operating expenses, accounts and credits to reserves for any purpose was outlined by the speaker as a usurpation of the powers of a board of directors and goes beyond what is proper regulating.

Address by Welsh

W. J. Welsh, President of the Empire State Gas and Electric Association, opened the second morning session with a splendid address on the Accountant and the Public. He stressed the importance of accuracy in preparing bills and the speed with which errors should be corrected or adjusted without lengthy investigation.

Ernest Johnston, of the Syracuse Lighting Company, submitted the results of a very careful study of the cost of installment selling and H. C. Davidson, of the Consolidated Gas Company, spoke on "The Accountant's Contribution to Merchandising." He pointed out the necessity of the accountant being a part of any discussion on merchandising policies and the important position he should hold in the analysis of costs.

Miss Ethel A. Conklin, of the Consolidated Gas Company, chairman of the Women's Section of the Association, addressed the meeting on "The Customer As An Individual." The splendid system of customer contact used by her company was described by her.

A. R. Keller, of the Syracuse Lighting Company, J. Gordon Ross, of the Rochester Gas & Electric Corporation, and M. E. Brown, of the Brooklyn Union Gas Company, all presented papers on Collection Methods and Their Effect on Public Relations.

Clifford Paige, vice president of the American Gas Association, delivered a splendid address on the Accountant and the Engineer. Eternal vigilance, the price of virtue, is the slogan of the accountant, the speaker stated. Accounting and engineering are precise, inflexible and exact and cannot be compromised. Management on the other hand must be flexible and compromising. Accountant or engineer must not tolerate error. We are all servants and the test of value to management is how well we understand that, the speaker pointed out.

H. M. Brundage, vice president of the Consolidated Gas Company, in closing spoke of the splendid administration of the Section affairs by the present officers and admonished the audience to carry the message of the meeting back to their companies and associates.

New Jersey Gas Association Holds Annual Convention

THE meeting of the New Jersey Gas Association, April 25th, at Asbury Park, New Jersey, mustered a good attendance and afforded a number of worth while papers and addresses.

President R. A. Koehler in his address noted the progress made by the industry being done in the water heating, house heating and industrial fields. He also touched upon the need for the customer being educated to the point where he will "think of gas as the ideal fuel" and be sold the gas bill "on the basis of the service that gas renders." He cautioned against laying too much stress on past successes, advising an energetic study of the trends insofar as they affect the use of gas.

After a business meeting the convention was addressed by Major Alexander Forward, Managing Director of the American Gas Association.

The Customer Angle

W. H. Seeley, The Osborne Company, Newark, N. J., talked on the subject "Home and Work and Love to Do." Touching upon the attitude of the customer and the wider use of gas he said, "The gas management must realize that in order to sell the maximum amount of gas, it must have a tremendous number of satisfied, enthusiastic customers." Continuing, he said, "the woman whose gas range is out of date, whose water heater is antiquated is not an enthusiastic customer. Running up and downstairs to light and turn out a small tank water heater, sitting in the movies or the theatre or at her bridge party and wondering whether she has forgotten to turn off the water heater isn't going to contribute to the happiness or the enthusiasm of a customer."

"The accountant in the companies of the gas industry selling merchandise can perform an invaluable service by a proper computation and analysis of every element that enters into the cost of conducting the business. One of the important features of his work is to analyze the cost and compare the costs of different periods. These comparisons in the hands of the executives in charge of the merchandising in the company will inform them as to where expenses should be reduced and sales increased."

While his paper, "Merchandise Accounting," treated of the subject in a general way it contained many valuable thoughts and suggestions.

In conclusion, W. L. Shively, Chemical Engineer, The Koppers Research Corporation, in his paper, "Oil Fog Lubrication of Gas Mains," said: "An oil-moist condition of the interior of the mains and services of a distribution system is an effective preventive of dust trouble and joint leakage which may occur with dry gas. Only a few gallons of oil per million cu. ft. gas, in the form of a fine fog, are required to 'lubricate' a system, and the cost is only a few hundredths of a cent per M cu. ft. gas treated. Laboratory and field investigations indicate that the particles composing the oil fog must not be larger than one-twenty-five thousandth of an inch diameter if they are to possess adequate persistence. A fog of such particle size may be produced by aromatization or vaporization methods. Such devices are now being successfully employed in the distribution of dehydrated manufactured gas and in conjunction with the introduction of natural gas into systems formerly used for the distribution of wet manufactured gas."

"The Manufacturer's Viewpoint"

"The Manufacturer's Viewpoint" was the title of an interesting paper read by E. S. Dickey, Vice Chairman, Manufacturers' Section, A. G. A. He said in part: "Any attempt to visualize the manufacturer's contribution to the advancement of the best interest of the gas industry must be predicated upon the manufacturer, equally with the gas man, being sold on gas as a fuel. The manufacturer must be a booster for gas with an enthusiasm equal to that of the gas man himself but, of even more importance, the manufacturer, in his effort to advance the interests of the industry, must so conduct his business as to secure the confidence, of the gas man and, through this confidence, endeavor to secure a more general acceptance by the industry as a whole for a closer co-operation between the manufacturer and the industry. The manufacturer realizes this cooperation is a necessity and feels this necessity must eventually be realized by the gas man in his viewpoint of an attitude toward the manufacturer."

A. J. VanBrunt presented the "Report of the Accident Prevention Committee" and H. A. Sutton handled the "Report of the Industrial and House-heating Section."

The well arranged program was planned by the committee consisting of John L. Conover, Chairman and J. D. Alden, Harlow C. Clark, Stanley Grady, James P. Hanlan, Ormsby F. Potter and Harry A. Sutton.

Mid-West Gas Association Hold Silver Anniversary Convention

J. M. Drabell, Cedar Rapids, was elected president of the Mid-West Gas association at its silver anniversary convention in the Hotel Russell-Lamson, Waterloo, Ia., April 14-16. He succeeds E. H. Vierigg, Grand Island, Nebr. Other officers were elected as follows: John J. Swanson, Minneapolis, first vice president; W. E. Derwent, Rockford, Ill., second vice president; R. B. Searing, Sioux City, secretary-treasurer; R. H. Garrison, Chicago; H. R. Schmidt, St. Paul; R. E. Taylor, Ottumwa; R. L. Klar, Des Moines; Frank Millholland, Omaha; C. T. Williams, Sioux City; A. T. Barrett, Chicago; P. J. Montgomery, Grand Forks, N. D., council members. Three hundred representatives from Iowa, Nebraska, Minnesota, North and South Dakota utilities attended the session.

Retiring President Vierigg entertained the past presidents of the organization at a dinner party during the convention with more than a dozen former executives of the association his guests.

House heating by gas and its early wide spread use was outstanding topic of the discussion and possibilities and prospects of the development of that phase of utilities within the next two decades made one of the most interesting round-table discussions of the session.

Principal among the score of speakers who discussed various utilities topics as they related to gas manufacture, use and servicing, were Bernard J. Mullaney, Chicago, "What's Ahead of Us?"; C. A. Nash; Joseph Ainsworth, Ames; C. A. Miller, Electrolux company, Chicago, on gas refrigeration; Carl B. Meyers, Cedar Rapids, report of the accounting section of the American Gas association convention; Alfred Uhalt, Cleveland, "Training Salesmen,"; and E. J. Otterbein, Davenport, "Customers Relations and Cooperation With Other Departments."

EQUIPMENT NEWS

New Locking Cock

There recently has been developed a locking cock by Freud Metal Products Company, Park Row Building, New York City, which is claimed to possess some new and desirable features. An explanation of this device abstracted from the patent papers follows.

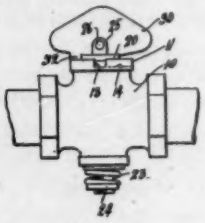


Fig. 1

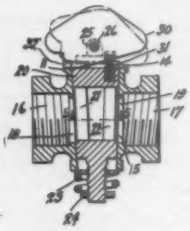


Fig. 2.

The cock or valve is shown in figure 1 in an open position. In closing the same the right hand end of handle 30 is depressed against spring 31 (see figure 2) with pivot 26 as the turning point. This movement causes end 32 to be lifted out of a slot or groove and permits it to clear the top of flange 11. Then the handle is revolved at right angles. Then end 32 is directly in line with notch or groove 13, at which time the handle is released and spring 31 forces the end 32 into groove 13. In opening the reverse operation is carried out.

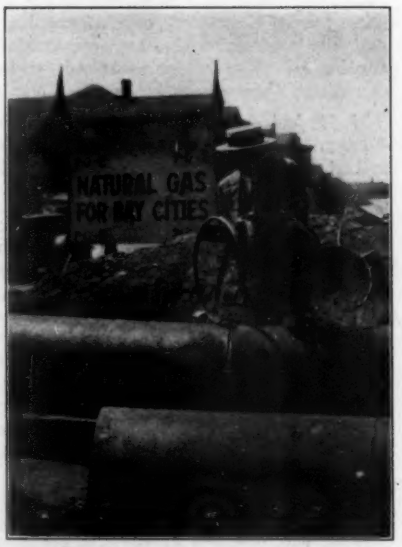
This cock is claimed to be simple and positive in operation and to be little likely to get out of order. It is now being produced in a number of sizes. Further details upon request.

Convenient Templet for Fabricating Bends in Large Pipe

The terminal section of a 20-in. oxwelded natural gas line recently constructed by the Pacific Gas & Electric Company was laid under city streets, where frequent changes in direction necessitated the use of a great many 3-piece, 45-deg. bends and 5-piece, 30-deg. bends. The usual procedure for making a miter bend requires rotating one section of the pipe 180 deg. in order to match up the ends for the bend, but a different method was developed for this job which greatly facilitated alignment and fabrication of the bends in the large diameter pipe.

A 22½-deg. gore was cut from a piece of 20-in. pipe and this became the templet. It was cut in two at the widest part and a hinge was welded on to the two halves. Lug sections were welded on to the two ends to aid in maintaining the proper curvature of the templet. The outside edges were beveled to facilitate marking the pipe. The center sections of the two halves of the templet were cut out to reduce the weight and handles, formed from pieces of welding rod, were welded on, as shown in the illustration.

In making the cut with this templet a section 6-in. long on the back wall of the pipe is left uncut, which aids in maintaining correct alignment. When the cut has been made and the section removed, the 6-in. uncut section in the back wall is heated with the blowpipe and the pipe is then bent around to the correct position without any lifting. A 45-deg. bend requires two cuts and welds, a 90-deg. bend



four cuts and welds. Spacing between cuts is determined by construction details, but wherever possible, long radius bends were used for this large diameter pipe.

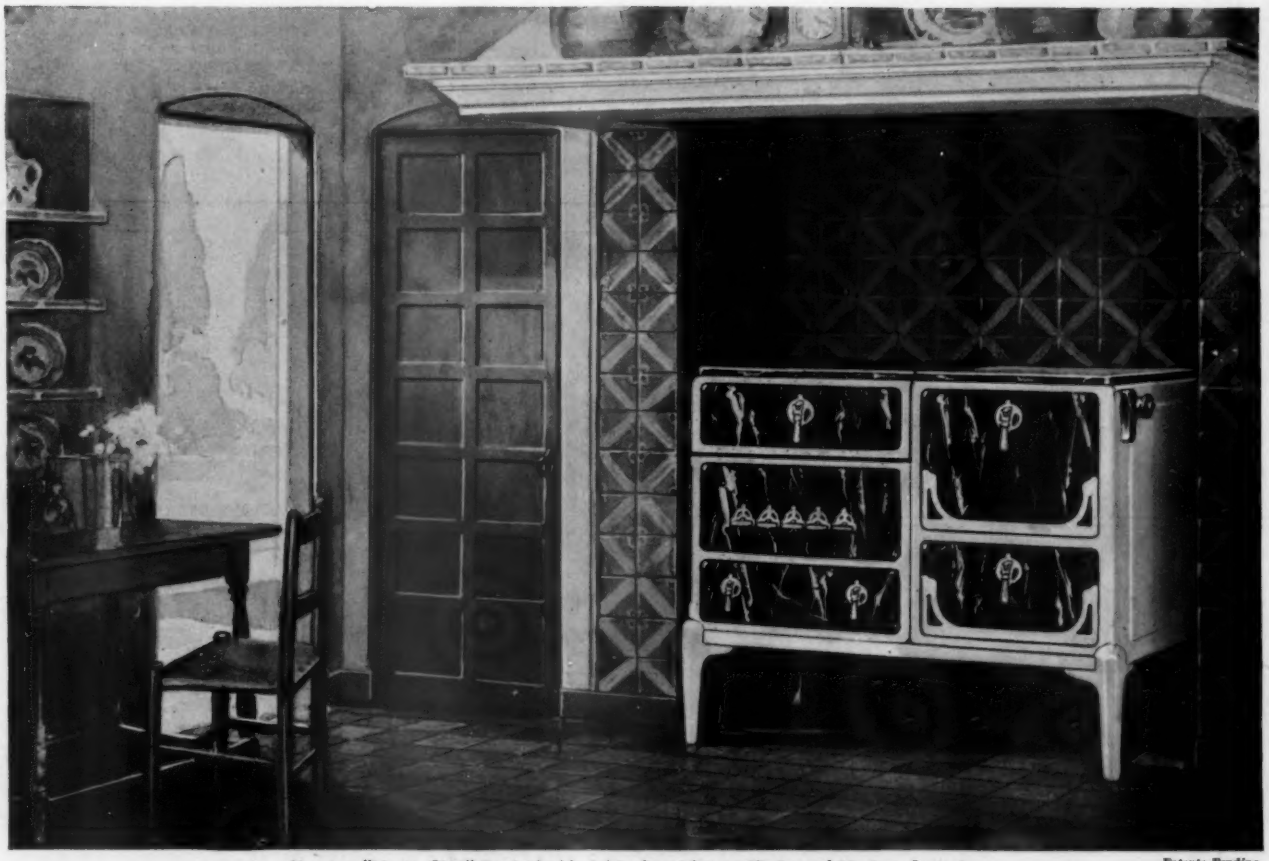
This type of templet was used during the entire construction of the line, being very popular with the welders because of its convenient features.

New Reznor Gas Fired Warm Air Heating Unit

The Reznor Manufacturing Co., Mercer, Pa. have recently issued a booklet entitled "The Ultimate Method of Heat-

ing," in which they describe the new Reznor gas fired warm air heating and ventilating furnace. The illustration shown is that of their 1-U. R. Heater which is particularly adapted for heating stores,

(Continued on Page 79)



Showing "Magic Chef" Patrician Model in Spanish-type Kitchen of Modern Bungalow

Patents Pending

Magic Chef Will "Grade Up" Sales

IF MAGIC CHEF, the New Vogue in Gas Ranges, is shown FIRST to every prospect who enters your store, the result MUST be the sale of MORE GOOD gas ranges.

● Women, as a whole, want better and more beautiful furnishings for their homes. But, they demand that these qualities be instantly apparent. If they are not, no amount of persuasion on the part of the most expert salesman can convince that the higher price is warranted.

UNLESS the gas range has a RED WHEEL it is not a LORAIN

● Magic Chef is obviously a BETTER, MORE BEAUTIFUL gas range . . . distinctly new and different . . . attractive and efficient. Its display and demonstration immediately creates a desire for a better gas range whether or not the prospect is able to pay the price asked for Magic Chef.

● But, having seen Magic Chef and having been "sold" on its unique advantages, the buyer's conception of what constitutes real quality and beauty in a gas range, and what is a fair price to pay for real quality and beauty, is elevated to a plane that will more easily permit the sale of a stove that will bring you a satisfactory profit.

● You are therefore urged to show Magic Chef FIRST to every gas range prospect regardless of the "lines" that you carry, regardless of the models featured in your advertising, regardless of any apparent indications of the amount which the prospect desires or can afford to spend.

Magic Chef

The World's Most Beautiful Gas Range

AMERICAN STOVE COMPANY
DEPT. B, 801 CHOUTEAU AVENUE, ST. LOUIS, MO.

Largest Makers of Gas Ranges in the World

CASH-PRICE
$195.00
($210 West of the Rockies)
Send name and address for free copy of booklet showing modern kitchens.

RUUD-AUTOHOT

The World Has Been Its Proving Ground

1. PILOT LOCK
2. PILOT ADJUSTMENT
3. IMPROVED TANK
4. BRASS PARTS DIPPED
5. HARD BRASS GAS LINE
6. SEAMLESS DRAFT HOOD
7. IMPROVED LEG BRACING

In the ultimate of all tests . . . . actual and everyday use . . . . RUUD engineers have watched and checked the operation of the RUUD-AUTOHOT Automatic Storage Water Heater in the United States, Canada, England, Germany, Holland, Norway, Russia, Japan . . . . in *every gas-served country*.

All agree that its structural principles are correct, but from their wealth of experience drawn from actual observation, new and striking improvements have come to light that are now made a part of a new, finer RUUD-AUTOHOT.

Thus to you, through this internationally-famous name, comes renewed assurance of a water heater value never before equalled . . . *now made greater.*

THE RUUD $95 TWINS

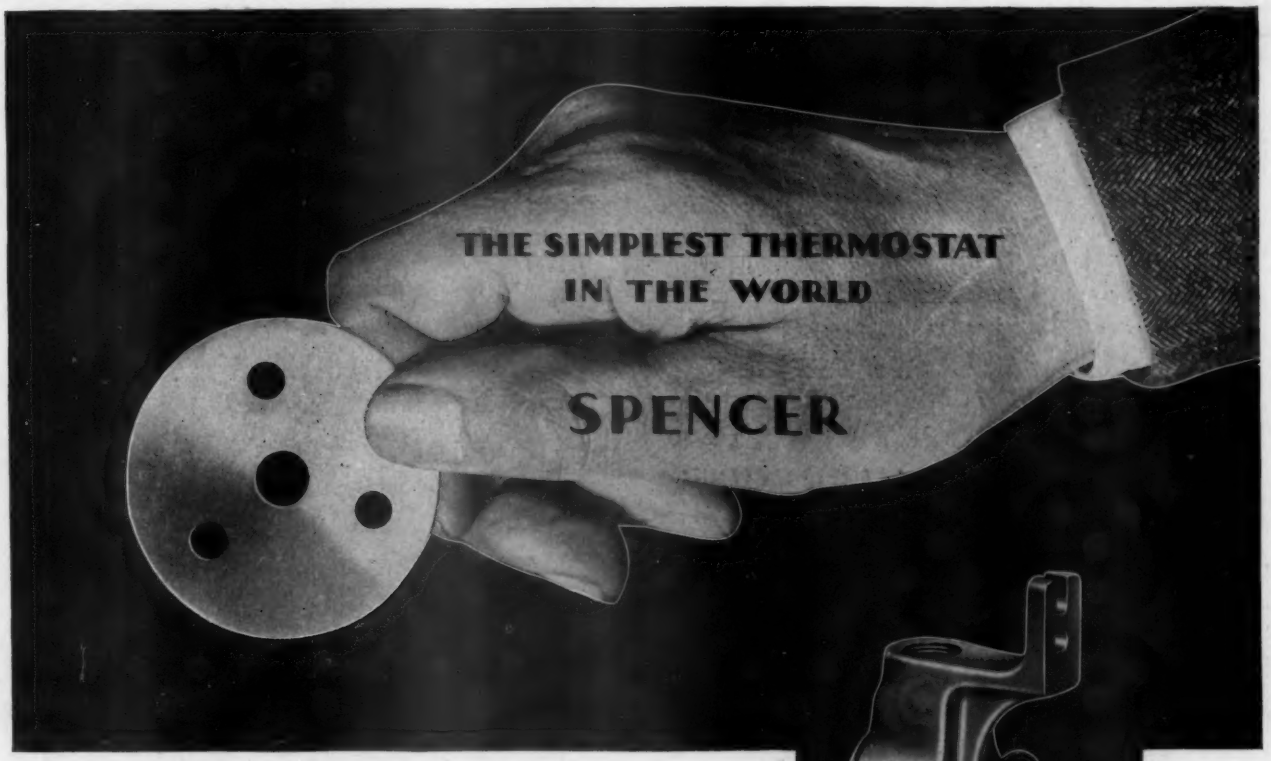
RUUD MANUFACTURING COMPANY
PITTSBURGH, PA.

TORONTO HAMBURG LONDON

Branches in all large cities

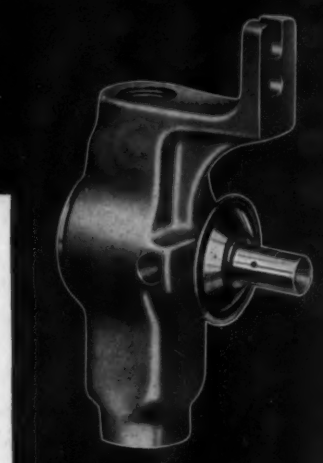
Factory representatives everywhere

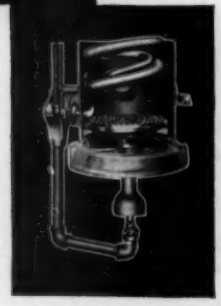
Have You Seen the Ten To One Merchandising Plan? Write For It



KLIXON SAFETY PILOTS

FOR • • • • • • • • •
AUTOMATIC STORAGE WATER HEATERS





KLIXON Products have the exclusive use of the patented Spencer Snap-Acting Thermostatic Disc shown above. This simple bi-metallic, concave disc is a complete thermostat in itself, snapping from concave to convex and vice-versa at a predetermined temperature. It furnishes its own motive power and acts with a powerful, positive thrust, without the use of mechanical advantages of any kind. As applied to this Klixon safety pilot for circulating tank heaters it shuts off the main gas supply positively if the pilot flame is extinguished for any reason. This safety pilot has been thoroughly tested in use, and is used as standard equipment by some of the largest manufacturers of circulating tank heaters. In its simplicity there is safety, economy, and freedom from trouble.

May we send a complete descriptive folder?

SPENCER THERMOSTAT CO

CAMBRIDGE · · · MASS

REDUCTION!!

THE TREMENDOUS INCREASED USE OF COPPER WATER HEATERS HAS MADE THESE PRICES POSSIBLE.

KOMPAK
COPPER BOILER
WATER HEATER

No. 20—Old Price, $185. New Price $130.
No. 32— " " $210. " " $160.

All other sizes, including the large horizontal copper systems reduced in proportion.

These new low prices for a heater of such well recognized quality as the Kompak,—have proved to be a wonderful stimulant for Quality Water Heater Sales.

THE KOMPAK COMPANY,
New Brunswick, N. J.

KOMPAK

New Reznor Heating Unit

(Continued from Page 74)

halls, auditoriums, clubs, offices, schools, churches, etc.

This heater employs no sheet metal in the combustion or heating elements, and has no cemented joints but is entirely of cast iron construction. The burner is cast in a single piece of gray iron with raised drilled ports and extends full length of combustion chamber. The burner and injection tube are readily removable through the door.

The booklet shows sectional views of the heater and contains complete information on installation, etc. The company also assembles in a single casing containing 2, 4, 6 and 8 units as described above with total delivered capacities up to 400,000 B.U.T. per hour, with forced circulation and automatic control. A copy of the booklet will be mailed on request.

Gas Utility Sales Recede in February

The month of February witnessed some further slowing up in sales of manufactured gas utilities, according to reports received by the Statistical Department of the American Gas Association from companies representing approximately 88 percent of the manufactured gas industry. As of February 28 the customers of the reporting companies aggregated 8,789,077, while sales for the month totalled 32,307,861,000 cubic feet, an increase of 1.5 percent from the same month of the preceding year.

With the exception of New England, most sections of the country reported February sales hardly more than, and in some cases less than, the same month a year ago. In the Middle Atlantic States, February sales were approximately the same in both years. In this region New Jersey Companies reported an increase of nearly 5 percent while in Pennsylvania the gain was more than 8 percent. In New York State however sales were down nearly 4 percent.

In the East North Central States, sales for the month gained 2 percent, but in the South Atlantic and Pacific Coast States there was a decrease of somewhat more than one percent. In New England however February sales were nearly 6 percent greater than a year ago. In this region gas sales for industrial-commercial purposes declined nearly 9 percent, but this loss was more than offset by a gain of 4 percent in regular domestic sales and an increase of nearly 40 percent in gas sold for househeating purposes. In Massachusetts, despite a decline of 16 percent in industrial-commercial sales, total sales gained 6 percent, the result, in large part of a 5 percent gain in regular domestic sales and a 46 percent increase in househeating sales. In Connecticut the gain in this latter class of business was 53 percent.

Reports received from a group of the larger natural gas distributing utilities, with customers aggregating 1,627,282, indicate a decline of nearly 5 percent in February sales as compared with the same month of the preceding year. It is doubtful however if all of this decline in sales of the natural gas utilities may be ascribed to general business and industrial conditions, as an appreciable proportion of these companies output is devoted to such uses as househeating, where consumption is influenced more by climatic and weather conditions than by purely economic factors. During February most sections of the country experienced generally mild weather conditions, which doubtless contributed materially toward some lessening in gas sales for househeating and other domestic uses.

Civil Service Act Held Valid

A very unusual point of the law was involved in the recent case of Reilly v. City of Chicago, 168 N. E. 904. In this controversy the validity of the following Civil Service law was contested:

"No officer or employe in the classified civil service of any city, who shall have been appointed under said rules and after said examination, shall be removed or discharged except for cause, upon written charges and after an opportunity to be heard in his own defense . . . . . Nothing in this section shall be construed to require such charges or investigation in cases of laborers . . . . . ."

A laborer, who was employed as a civil service employe in the gas plant department of a city, was discharged without being given notice and no written charges were filed against him. He filed suit asking for reinstatement on the grounds that the statute is invalid because it discriminates between laborers, and other civil service employes, since the law requires notice to be given and written charges to be filed against all employes except laborers before a discharge.

However, the Court refused to order the reinstatement of the laborer, and in holding the law valid, said:

"Labor has been held to be property . . . . . It does not follow, however, that appellant has a property right in the position which he has occupied. One has no property right in an unearned salary . . . . . Positions or places held under the Civil Service Act are in the nature of offices, and the salary created by the act is not property. The right of compensation grows out of the rendition of services, and not out of any contractual relation . . . . . Is there any reasonable basis for this discrimination against laborers as distinguished from others under the Civil Service Act? . . . . . We are of the opinion that this provision finds basis in a substantial distinction between a laborer and others included under the Civil Service Act, which distinction bears a reasonable relation to the purposes of the legislation, and that the difference in manner of discharging appellant there provided does not render the act invalid."

GAS—THE BENEFICENT FUEL

F. A. LEMKE

LIVING—modestly even—requires day after day cooking, heating, bathing, shaving, laundering and cleaning, met or partly met with fuels other than gas. Each such fuel—whatever it is—costs in money, time, effort, waiting and general inconvenience. Those costs cease when gas is used and, whether smaller or larger than the gas bill, pay or in large part pay the gas bill. In some cases the actual money savings more than pay the gas bill, and with the added saving of storage expense, handling of ashes, waste disposal and troublesome mussiness, plus the comfort of cleaner, healthier, more pleasant living conditions for the whole family.

Gas is the most flexible and the most controllable of all fuels. Whether it be the sudden desire for a pot of coffee, a bath, a shave, or what, the heat required and the results desired are always at hand without fore-preparation, storage, waiting or effort. Light the gas—use what you wish—shut it off.

The regularly received gas bills are splendid in that they permit regular and frequent comparison that quickly points out any expensive carelessness in your home—something not so easy to do with other fuels. This fits into the growing national program of conservation—of waste prevention—a very distinct and important advantage. The recording of the gas meter is a true record and measure of benefits secured. The gas bill is made according to it. A small gas bill indicates limited benefits secured and, as the possible benefits or returns are in exact proportion to the amount used, a larger bill indicates the receipt of larger benefits. These benefits are realized through appliances—water heaters, gas stoves, room heaters, etc. These are all more than mere pieces of equipment; each is a key that unlocks the greater comfort, the better and more healthful living conditions, and all the other advantages procurable through the use, and only from and through the use of gas. Therefore, the more complete your household equipment—the more purposes for which you use gas—the more reason to appreciate that it exists for your use.

It lengthens life itself. A household can sleep later and more time is provided for cultural and pleasurable pursuits. Every phase of existence is made easier and better.

One constant, permanent daily need of every home is the hot water required by everyone in the family—adults and children, servants and visitors, too—for cleanliness, self-respect, health and comfort. The march of science steadily emphasizes the importance of hot water and recommends larger use of it, both as a preventative and a curative.

NEWS OF THE GAS INDUSTRY

Negotiations Completed in Large Natural Gas Deal

Negotiations have been completed between the Eastern Gas Company, Newcastle, Ind., of which Arthur B. Ayres is owner, and the Goodrich interests in Indiana, in one of the largest natural gas deals in this section for many years. The local utility company purchased the Central Fuel Company of Rushville, owned by Engineers, Inc., of Indianapolis. The consideration was not made public.

James P. Goodrich, former governor of Indiana, William Goodrich, and R. W. Frost were the principal owners of the Rushville company. In the transaction, Mr. Ayres bought seventy-eight producing wells, a gas holder of 100,000 cubic feet capacity located in Rushville, and all the lines and franchises of the company, and took over 52 leases on approximately 10,000 acres of land. The company is serving twelve towns with natural gas.

Will Develop Gas Lands

The Texas Gas Utility Company, as a subsidiary of the Appalachian Gas Corporation has been formed for the purpose of developing about 215,000 acres of land in Dommit, Maverick and Zavella counties, Texas.

New Line To Superior, Nebraska, Announced

The Cities Service Gas Company, natural gas subsidiary of the Empire Companies, announced April 1 the construction of an 8-inch natural gas pipe-line from Lyons, Kas., to Superior, Neb., a distance of 116 miles. The line will be an extension of the Cities Service Gas Company's 8-inch line from Hutchinson to Lyons, a distance of 29 miles. The project, which will include two compressor stations, is expected to be completed early next fall.

The new line will pass through Ellsworth, Lincoln, Beloit and Mankato, which are among the larger Kansas towns to be served by the extension. The project also includes the construction of branch lines which will serve Sylvan Grove, Luray, Osborne, Smith Center and other towns.

Wins Safety Contest

The Prospect street plant of the Citizens Gas Company, Indianapolis, Ind., has been announced as winner of the six months safety contest of 25 industrial plants of this city. The campaign was conducted by the local Chamber of Commerce safety committee. The gas plant had a total of 458,237 working hours without a single accident. The Langsdale plant of the same company had a record of no accidents, but did not have as large a total of hours. Approximately 10,000 employes participated in the contest. There was a total of 245 accidents in all plants involved, with a resulting total of 2,231 working days lost.

Lower Gas Rates for Industrial Customers

Lower gas rates for customers of The Philadelphia Gas Works Company using more than 500,000 cubic feet per month have been established by the Municipal Gas Commission, according to an announcement by Samuel M. Vauclain, chairman of the Commission.

The revised rate schedule, which became effective May 1 for customers where the gas company's distributions mains are suitable to supply the service desired, are as follows: First 50,000 cu. ft. (per Mcf.) $1.00, next 50,000 cu. ft. (per Mcf.) 90c, next 400,000 cu. ft. (per Mcf.) 80c, next 500,000 cu. ft. (per Mcf.) 70c, next 2,000,000 cu. ft. (per Mcf.) 60c, next 2,000,000 cu. ft. (per Mcf.) 50c, Over 5,000,000 cu. ft. (per Mcf.) 45c.

This is a reduction of 5 cents a thousand cubic feet in the fourth block, 10 cents in the fifth, 15 cents in the sixth and the establishment of the new rate of 45 cents a thousand for consumptions over 5,000,000 cubic feet a month.

In addition to the above a house heating rate of 75 cents a thousand cubic feet is in effect. This is a separate meter service and is based on a minimum consumption of 200,000 cubic feet during the heating season.

In commenting on the new schedule, Conrad N Lauer, president of The Philadelphia Gas Works Company, said:

"As a continuance of our expressed policy to help Philadelphia manufacturers to obtain an ample and cheap supply of gas for fuel in order to maintain and enlarge Philadelphia's industrial supremacy, and to enable its manufacturers to compete in the markets of the world, we are announcing important reductions in the price of gas.

"Increased sales and economies of operations obtained during the first seven months of the present fiscal year cause the management to be hopeful that it may be possible to make a substantial reduction in the retail gas rate as of January 1, 1931."

Obtain Franchises

Missouri-Kansas Pipe Line Company has just obtained franchises to distribute natural gas in two additional Indiana, one Kentucky and one Kansas town, Frank P. Parish, president, announced. These are Rockport and Troy, Indiana; Whitesville, Ky., and Lane, Kas. In the last year, markets supplied or contracted for gas by Missouri-Kansas have increased from 13 to 31. Ten of these are in Kentucky, four in Indiana, three in Missouri and one each in Illinois and Kansas.

Plan 4th Panhandle Line

Announcement has been made by L. B. Denning, president of the Lone Star Gas Company of Dallas, Texas, that his company would construct a 900-mile natural gas line from the Texas Panhandle to Lincoln and other Nebraska cities, at an estimated cost of between $40,000,000 and $50,000,000.

Associated with the Lone Star Gas Company in the construction of the line will be the United Light and Power Company and the North American Light and Power Company.

The line will extend northeast, probably from Moore County, Texas, through Oklahoma, kansas and the eastern part of Nebraska, serving Lincoln and Beatrice, Neb.; and Redoak, Shenandoah, Fort Dodge, Sioux City, Clear Lake, Mason City, Des Moines, Council Bluffs, Iowa, and intervening territory. It will involve the delivery of approximately 200,000,000 cubic feet of gas daily.

Construction will start immediately and will be rushed to completion. This will be the fourth long distance line carrying natural gas from the Panhandle to other states.

Seek Franchise

Everett Baxter, general superintendent of the Central West Public Service Company, has submitted proposal to Mayor Fred A. Gordon of South Sioux City, Nebr., for franchise to establish and maintain gas service to residents of the city. Mr. Baxter said that if the franchise is granted work upon the system will be started at once. Proposed rate is $1.75 a thousand for the first 2,000 cubic feet; $1.50 a thousand for the next 3,000 feet and $1.25 a thousand for all in excess of 5,000 feet with a minimum charge of $1.75 a month.

Gas Service Planned

Articles of incorporation were filed by the Colorado Natural Gas Corporation, Alamosa, Colorado, capitalized at $1,000,000. The incorporators are John M. Hood, Vernon J. Tovatt, Otis H. Twaddle, John T. Oakley and James D. Pilcher. It is proposed to serve Alamosa and nearby cities with natural gas.

(News Continued on Page 82)

A size for every kitchen and every cooking need.

NEW LIFE IN GAS RANGE SALES!

The new Smoothtop will put new life in your gas range sales. It is the outstanding gas range specialty . . . the only gas range of its kind on the market. New, exclusive cooking features permit new easier, better cooking methods.

National advertising tells to the housewives of your city the story of the new Smoothtop's enclosed-top, 4-heat zone cooking that "Captures the Flavor ...Frees the Cook". In addition to local newspaper advertising helps, floor displays, window displays and cooking schools, you can have free training of your staff in up-to-date salesmanship.

No competition...once you've sold a prospect on Smoothtop's features she cannot shop around the corner and buy it elsewhere. And remember Smoothtop's longer specialty profit!

Write while dealership is open . . . to Standard Gas Equipment Corporation, 18 East 41st Street, New York City. Makers of . . . Smoothtop . . . Oriole . . . Acorn . . . Vulcan . . . the standard domestic and heavy-duty gas ranges wherever gas is used. Pacific Coast Distributor: Northwest Gas & Electric Equipment Co., Portland, San Francisco, Los Angeles.

Smoothtop

GAS RANGE

CAPTURES THE FLAVOR . . . FREES THE COOK

Northern States Power Co. Earnings Increase in 1929

Gross and net earnings of Northern States Power Company increased substantially in 1929 according to the annual report, issued recently, despite large rate reductions made effective during both 1928 and 1929. Gross earnings were $32,754,119; an increase of $1,414,398, or 4.51 per cent, while net earnings increased $690,098, or 4.28 per cent, to $16,787,479.

The ratio of operating expenses to gross earnings for 1929 was 48.75 per cent, as compared with 48.64 per cent in 1928 and 49.36 per cent in 1927. The sale of electricity for power and light accounted for 82.91 per cent of the Company's gross earnings and 91.36 per cent of the net earnings.

Excluding customers served indirectly through wholesale contracts, the Company serves a total of 462,982 customers of all classes, a gain of 12,403, or 2.75 per cent. Electric energy output increased 6.64 per cent to a total of 969,071,015 kilowatt-hours. Gas output was 4,068,930,000 cubic feet. Nine communities were added to the system, making a total of 597 cities and towns now served.

Net construction expenditures during 1929 were $6,187,543. The 1930 construction budget is $12,655,000.

On February 28, 1930, the Company received the 1929 Harvard Advertising Award for the best local advertising campaign conspicuous for the excellence of its planning and execution. The campaign which won the award consisted of a series of eight newspaper advertisements advertising the benefits of low cost electricity in the home, built around the slogan "The Power of a Penny."

During the year the Company reduced its funded debt outstanding $1,507,240 and reacquired $3,382,900 par value Seven Per Cent Cumulative Preferred Stock. There was sold from the treasury $1,249,300 par value Six Per Cent Cumulative Preferred Stock and subscription privileges offered to holders of Common Stock of record January 7, 1929, resulted in the issuance and sale of $4,879,000 par value Class "A" Common Stock and 104,166-1/3 shares Class "B" Common Stock.

As of December 31, 1929, the Company had approximately 63,700 preferred shareholders.

Convention Calendar

May

19-20 American Refractories Institute, Annual Meeting, White Sulphur Springs, W. Va. Dorothy Dexter, Oliver Building, Pittsburgh, Pa., secretary.

21-23 Joint Production and Chemical Conference, Hotel Cleveland, Cleveland, Ohio.

June

10-13 Southern Gas Association, Savannah, Ga. G. H. Schlatter, Birmingham Gas Co., Birmingham, Ala., secretary.

13-14 New England Gas Association, Summer Sales Conference, Hotel Griswold, New London, Conn. C. D. Williams, 41 Mount Vernon Street, Boston, Mass., secretary.

16-19 National Association of Purchasing Agents, Fifteenth Annual Convention, Stevens Hotel, Chicago, Ill. G. A. Renard, 11 Park Place, New York City, secretary.

16-21 Home Service Course in Domestic Gas Appliances at American Gas Association Testing Laboratory, Cleveland, Ohio. (Second Year)

24-25 Canadian Gas Association, Halifax, Nova Scotia. G. W. Allen, 21 Astley Avenue, Toronto, Ont., secretary.

July

1-2 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich. A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich, secretary.

7-25 Summer Course for Home Service Workers, Columbia University. (Fourth Year).

31-Aug. 1 Wisconsin Utilities Association, Commercial Section Convention, Green Bay, Wis. John N. Cadby, 105 Wells Street, Milwaukee, Wis., executive secretary.

Plan Extension of Natural Gas Lines

Plans for the extension of its natural gas lines by some 800 miles at a cost of $15,000,000 have been announced by J. H. White, president of the Southern Natural Gas Corporation and its associated companies.

In Georgia the work will bring natural gas into Macon, Milledgeville and Griffin by a Southern extension of the line now serving Atlanta, while in other states cities to be served include Salma, Auburn and Montgomery in Alabama, and Jackson and Meridian in Mississippi. From the latter places a line is planned to the Gulf Coast to serve Mobile, Ala., and Pascagoula, Miss.

Of the total appropriation, it is stated, $3,000,000 will be spent in Georgia, $4,500,000 in Alabama and $7,500,000 in Mississippi.

Completion of these extensions will bring the amount invested in the Southeast up to $40,000,000. The system will occupy approximately 1,700 miles. And the estimated population to be served will be 1,300,000.

Schedule of Rates to be Applied by the Alabama Natural Gas Corp.

Rates to be applied by the Alabama Natural Gas Corporation, a subsidiary of the Southern Natural Gas Corporation in north Alabama has been prescribed by the state public service commission.

Two schedules are provided one for the towns for general gas service, both commercial and domestic. The towns affected are Calera, Cordova, Heflin, Leeds, Pell City, Ragland, Reform and Silura where the rate will be as follows: for first 300 cubic feet or less per month, a net charge of $2; for the next 2,700 feet a charge of $1.20 per 1,000 cubic feet; for the next 2,000 feet per month a charge of 85 cents per 1,000 feet and for all over 5,000 feet per month 65 cents per 1,000 cubic feet. The minimum monthly charge will be $2.

A wholesale service rate will apply to the counties of Blount, Jefferson, St. Clair, Walker, Pickens, Talledega, Tuscaloosa, Cherokee, Calhoun, Cleburne, Shelby and Etowah. This rate follows: for first 45,000 cubic feet of maximum daily rate of use per month, $1 per 1,000 cubic feet; for the next 55,000 cubic feet, 75 cents per 1,000 feet; for next 100,000 feet, 50 cents per 1,000 feet and for all over 200,000 cubic feet per month, a charge of 25 cents per 1,000 cubic feet is added.

The rates are based on the company's maintaining an average heat standard of 960 B.T.U. per cubic feet of gas.

Reduces Cost of Helium Gas

Uncle Sam's helium gas plant at Amarillo, Texas has been producing helium gas at a cost of only $9.64 per 1,000 cubic feet, the same amount which the government paid $34 for when buying from a private concern. There is not much demand for the helium just now; but a second unit is being installed so that this plant can furnish the Navy Department with most of the helium it may require.

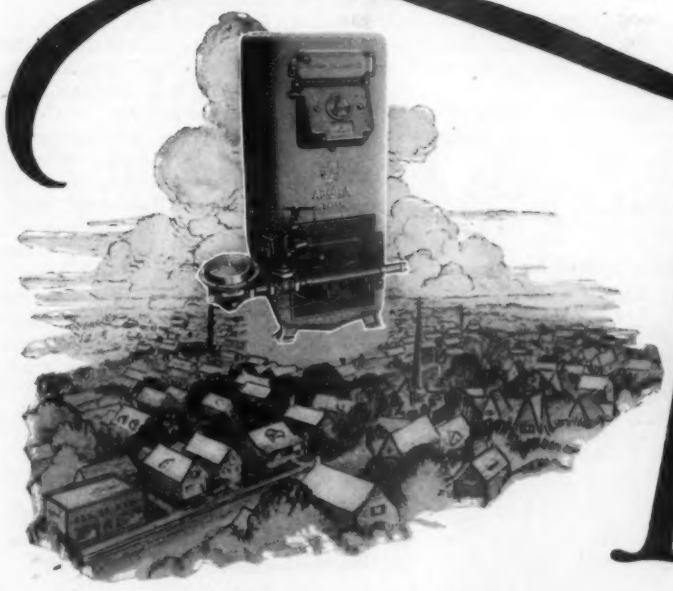
Permission Granted to Issue Bonds

The Southern Indiana Gas and Electric Company of Evansville, Ind., has been granted permission by the Indiana public service commission to issue stocks and bonds amounting to $600,000 to cover the cost of 1930 construction.

Hamilton Gas Company Purchase Kentucky Property

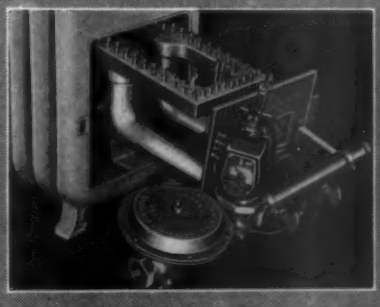
The Hamilton Gas Company has purchased in fee, the gas and oil rights on the property of Senator W. E. Chilton in Knott, Perry and Breathitt Counties, Kentucky, consisting of 15,000 acres.

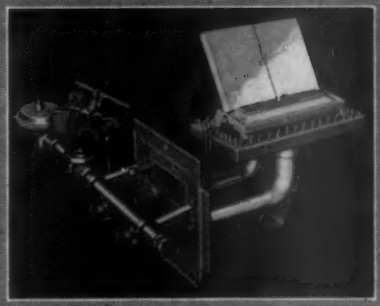
(News Continued on Page 84)



To every Arcola Heated Home you can now sell the Convenience of

AUTOMATIC GAS HEAT





TYPE "R" JANITROL

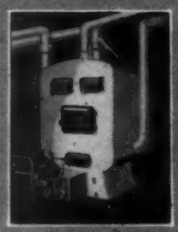
The Type "R" JANITROL, built especially for converting coal burning Arcolas to complete gas fired systems, is ready for shipment. It was carefully developed and represents a burner which we can recommend as being efficient, economical and worthy of your acceptance. It completes the JANITROL line.

To install the Type "R" JANITROL in an Arcola Boiler, simply remove the front plate and grates, slip the unit into place, fasten three screws, drop in the baffles, connect the piping and wiring, and light the gas. It is even simpler to install than the Type "X" JANITROL for larger units.

The new JANITROL is produced in three sizes, each of which fits two of the six Arcola models.

Write for catalogue giving complete specifications and information on this new type JANITROL.

The Surface Combustion Co.
INCORPORATED
Subsidiary of Henry L. Doherty & Co.
2375 DORR STREET, TOLEDO, OHIO
Branch Offices in All Principal Cities
Mantle Recuperator Division — METALLIC RECUPERATORS
Webster Engineering Co. — WEBSTER BOILER BURNERS
Member of Industrial Furnace Manufacturers Association



There's a JANITROL made to fit most any type boiler or furnace....

Utility Rate Association Headquarters Will be in Atlanta

Permanent headquarters for the Municipal Utilities Rate Association of Georgia will be located shortly in Atlanta, according to an announcement recently made by President W. M. Lester, of Augusta.

Offices are to be opened in the Chamber of Commerce Building, from which the organization will conduct its efforts to secure "fair rates for the customers of all public utility companies in the state, particularly the gas and electric companies."

At the same time, it has been announced, Dr. John J. Bauer, of New York City, a nationally known rate expert, has accepted the appointment of rate expert for the association and will spend a considerable portion of his time in the Atlanta office.

More than fifteen cities are already enrolled as members of the Municipal Utilities Rate Association, including Albany, Atlanta, Augusta, Barnesville, Columbus, Macon, Monroe, Newnan, Quitman, Statesboro, Thomasville, Waycross and others.

A special committee, composed of James L. Mayson, of Atlanta, chairman; O. W. Franklin, of Valdosta, and W. M. Lester, of Augusta, is now making a special study of the laws of Georgia affecting utility rates, and will recommend certain changes to the next legislature.

Plan to Erect New Gas Plant

The Utility Gas and Electric Company of Chicago, Ill., expects to begin work soon on a gas plant in Gainsville, Ga., according to an announcement made by James P. Gillies, vice-president of the company.

The initial expenditure on the plant will be $150,000, it is stated, and construction will include the building of offices for the company, as well as of the gas plant proper, and the laying of approximately twenty-five miles of gas mains in Gainesville and its environs.

The city commissioners recently granted a franchise to the company for the construction of the plant, with the stipulation that work upon the project begin within a period of six months.

Bring in New Gas Well

The Hamilton Gas Company announces that it has brought in a natural gas well in Cabell County, West Virginia, producing 2,200,000 cubic feet.

$2,000,000 For New Gas Lines

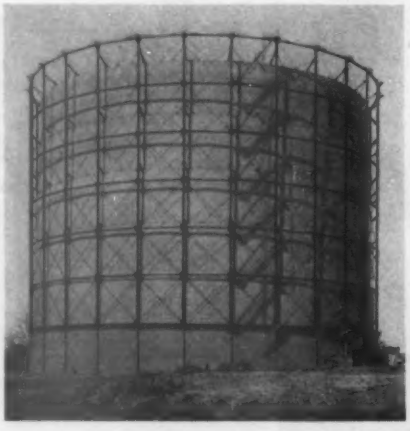
An expenditure of approximately $2,000,000 for laying new gas mains from the vicinity of Eagle Pass to Del Rio, Texas, with distribution at Carrizo Springs and Crystal City, has been announced by the Central Power and Light Company of San Antonio.

There will be 62½ miles of ten-inch main from the Maverick County gas fields to the company's new steam generating plant at the mouth of the Devil's River, 12 miles north of Del Rio.

Other pipeline improvements throughout the Winter Garden district are under consideration by this firm.

New Gas Holder Completed in St. Louis

Contruction of a 10,000,000 cubic foot capacity gas holder for The Laclede Gas Light Company has been completed by the Bartlett-Hayward company of Baltimore. It is one of the largest of its type west of the Mississippi river, with five lifts, a



total height of 230 feet and a diameter at the base of 273 feet.

The high pressure pumping station will have a capacity of 500,000 cubic feet an hour at ten pounds pressure. A synchronous motor driven gas blower will be used to force gas into the high pressure distribution system and a circulating hot water system, heated by gas, will be used to prevent the water seals from freezing during the winter months.

The new holder is in line with the Laclede's policy to be prepared to serve rapidly growing districts and is located in the northwest section of the city. The investment, together with the pumping station, is approximately $1,000,000.

Philadelphia Gas Company Holds Annual Rally

Employees of the Philadelphia Gas Works Company with their families, numbering more than four thousand persons, attended the company's annual rally recently. A feature of the program was a musical review, "Paris Bound," staged by employees, and selections by the P. G. W. Music Masters and the P. G. W. Men's Chorus.

Conrad N. Lauer, president of the gas company, in an address, pointed out that during the past year material economies in operation had been effected and thanked the organization for its cooperation in the management's effort to be a good tenant of the City's gas works property. Mr. Lauer also, on behalf of the American Gas Association, presented to an employee the Thomas N. McCarter medal, and to another the McCarter certificate for assistance in such work. The men honored were Elmer Humes, 2329 S. Colorado Street, who received the medal, and Thomas W. Bennett, 2725 S. 13th Street, who received the certificate.

During the evening a quarter century service club was organized and it was found that 220 employees of the company were eligible to membership, each having been employed in the Philadelphia Gas Works organization for twenty-five years or more.

Commonwealth Power Corp. Acquires Gas Properties in Massachusetts and Vermont

Announcement was made recently by E. F. Putnam, President of the Greenwich Water and Gas System, Inc., of the sale of a number of gas properties owned and managed by that company in Vermont and Massachusetts to the American Commonwealth Power Corporation interests.

The companies involved in the sale are the Vermont Lighting Corporation supplying gas service to Barre, Vt., St. Albans, and Springfield, Vermont; St. Johnsbury Gas Company of St. Johnsbury, Vermont, and the North Attleboro Gas Company in North Attleboro and Plainville, Massachusetts; also the Ware Gas Company of Ware, Massachusetts.

The properties have been owned and managed by the Greenwich Water and Gas System, Inc., since 1926 and during that time have been built up to a high degree of efficiency. Among the many improvements made have been the complete rebuilding of the distribution system at St. Albans, Vermont, installation of a water gas generator at Barre, and numerous improvements in the distribution systems. An aggressive campaign for the acquirement of new business has resulted in a considerable increase in number of customers and total amount of gross business since the properties have been under the management of the Greenwich Water and Gas System. It is understood that the present local managers will be continued in charge of their respective properties.

Natural Gas Extension

The Pacific Gas & Electric Co., San Francisco, Cal., has appropriated $358,250 to construct a natural gas distribution system to serve St. Helena, Calistoga, Yountville, Oakville, Oak Knoll, Rutherford and communities in Napa Valley.

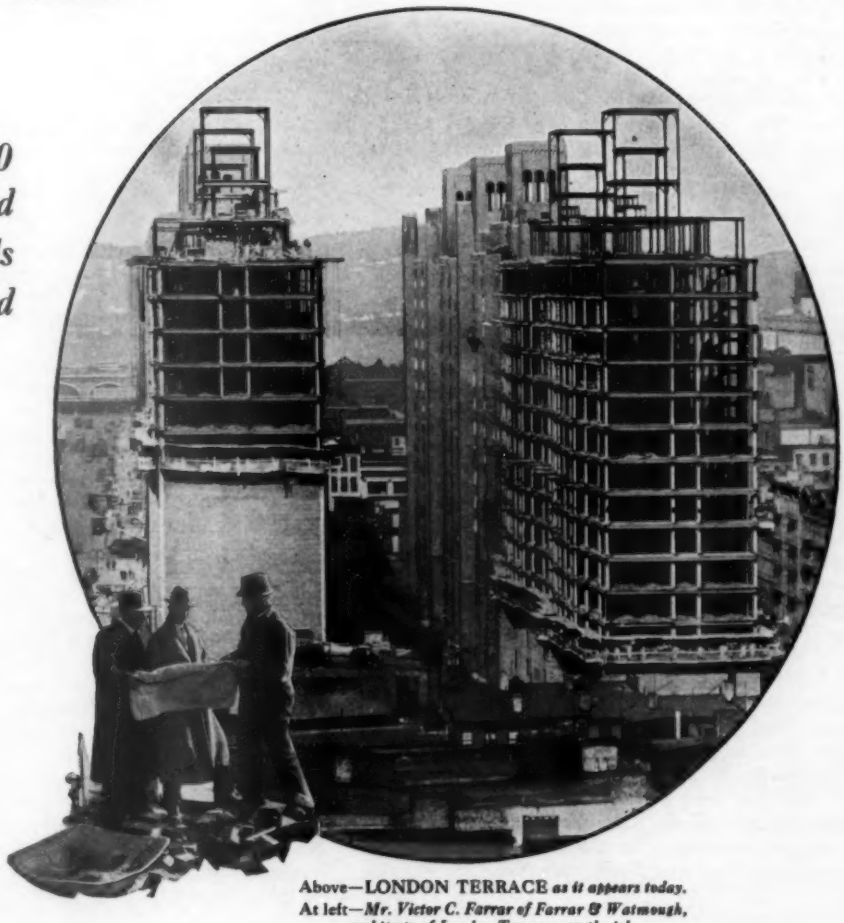
(News Continued on Page 86)

ELECTROLUX *chosen for*

World's *Largest* Apartment

New York's $25,000,000 London Terrace in record Electrolux purchase adds 30,042 MCF to yearly load

A tiny gas flame takes the place of all moving parts.



Above—**LONDON TERRACE** *as it appears today.*
At left—*Mr. Victor C. Farrar of Farrar & Watmough, architects of London Terrace—on the job.*

1,669 Electrolux units! And in *one* apartment dwelling! Never before has such an immense installation been planned for *any* refrigerator. Because, never before has there been such an apartment development as London Terrace. London Terrace—a city in itself. Covering 160,000 sq. ft. Consuming building materials enough to provide housing for 25,000 people. With a garden court as big as some city parks. A swimming pool, a gymnasium, restaurants—even a private police force. And in every one of the 1,669 spotless kitchens . . . Electrolux.

Daily you see apartment houses going up about you. Not as large as London Terrace, perhaps. Yet suppose they had only 10 apartments apiece . . . for example. Every Electrolux installed would increase billing an average of 18 MCF a year. Or, a total of 180 MCF. And it would bring more. A generous profit from the sale. Increased prestige for the gas company. An impetus to the sale of other gas appliances.

What are *you* doing about it? Training special Electrolux salesmen? Securing plumber and dealer cooperation? Merchandising the free trial offer? All these are vigorous means of making this rich market your own. Housewives, builders, owners, architects . . . we're telling them all about Electrolux. In their favorite magazines, in their professional papers. And for closing the order . . . we've prepared just the sales helps you'll need. Don't wait. Ask us about them today. Write, wire or telephone Electrolux Refrigerator Sales, Inc., Evansville, Ind.

ELECTROLUX

THE *Gas* REFRIGERATOR

Indiana Companies Seek Authority for the Purchase and Sale of Properties

Petitions have been filed with the Indiana public service commission asking authority for the purchase and sale of the properties between the Northern Indiana Public Service and the Interstate Public Service Company. Both companies deal in gas, power and electric interurban service. The proposals if approved will confine the territories served to more compact areas. The reproduction cost of the properties involved is put at $12,030,480.

The Northern Indiana Public Service Company proposes to purchase from the Interstate, properties located in what are known as the Goshen-Warsaw and Monticello districts. These districts at present are practically surrounded by territory served by the Northern Indiana Public Service Company. Approval of the transaction will give the latter company a territory directly across the northern part of the state, which, it is declared, will facilitate operation and improve service.

The Interstate proposes to purchase from the Northern Indiana company properties located in what are known as the Lafayette-Frankfort, Lebanon and Crawfordsville districts. These districts are in the same general territory already served by the Interstate Public Service Company. Both companies serve Lebanon, one with electric power and one with gas service. The petitions set out that these rearrangements will be for the public good. Both companies are subsidiaries of the Midland United Company.

The Northern Indiana Public Service Company properties which the Interstate is seeking to purchase are in and about the cities of Lafayette, West Lafayette, Crawfordsville, Lebanon and Frankfort. Property in these districts include a large electric generating station at Lafayette and gas manufacturing plants at Lafayette, Frankfort and Crawfordsville.

Standard Gas & Electric Co. Report Earnings for Year

Standard Gas and Electric Company and subsidiary and affiliated companies had combined assets of $1,090,992,598, at December 31, 1929, according to the consolidated balance sheet in the annual report, made public recently. Consolidated earnings for the year showed a balance equivalent to $7.01 a share on the average 1,467,904 shares of common stock outstanding during the year, and $6.59 a share on the 1,562,607 shares of common stock outstanding December 31, 1929. This compares with $6.57 a share on the 1,418,946 shares outstanding December 31, 1928.

The Company's public utility system now serves a total of 1588 cities and towns, having an estimated combined population of 6,300,000, seventy-one communities having been added during the year. At December 31, 1929, a total of 1,592,188 customers of all classes was served, an increase of 4.13 per cent. Electric connected load, or business served, increased 10.19 per cent to a total of 3,118,283 kilowatts. Electric energy output was 4,546,305,017 kilowatt-hours, an increase of 9.75 per cent, while gas output totaled 46,408,384,000 cubic feet, a gain of 7.32 per cent. The sale of domestic electric and gas appliances and the continued development of new business added a large amount of revenue producing load to the system lines.

Net construction expenditures of the subsidiary and affiliated public utility companies during 1929 totaled $38,059,019. The construction budget for 1930 is $60,127,000, of which $20,257,000 is for completion of work started prior to January 1, 1930.

Huge Budget Planned by Wisconsin Gas Companies

"Gas companies in Wisconsin will spend $7,000,000 this year for expansion and improvement of their properties annd plants which serve 338,000 customers or a population of 1,500,000 people," stated H. R. Broker, Racine, Wis., chairman of the gas section of the Wisconsin Utilities Association, in opening the annual two-day convention which was held at Racine. About one hundred fifty delegates from all sections of the state attended.

"I am reliably informed that gas companies of this state anticipate no curtailment of their building and construction programs," stated Chairman Broker. "The industry is healthy, not to say booming. Gas sales for the first quarter of this year have been bigger than the record-breaking figures for the same period last year."

"A dual system that will heat homes in winter and cool them in summer will be the next development of the gas utilities," declared A. A. Schuetz, Milwaukee, who spoke. "Engineers have already started experiments with the system," Mr. Schuetz added.

W. E. Kemen, distribution engineer of the Gas Light Co., Milwaukee, Wis., was elected chairman of the gas section for the next year, succeeding H. R. Broker. H. B. Hummel, manager of the Wausau Gas Co., Wausau, Wis., was elected vice chairman.

Purchase Gas Well

Missouri-Kansas Pipe Line Company has obtained a purchase contract on one of the largest gas wells in western Kentucky, the Lonnie Todd No. 1 near Earlington, Hopkins county, producing 3,690,000 cubic feet per day. Two other Missouri-Kansas wells in the neighboring Kirkwood Springs field test 7,650,000 cubic feet. A pipe line route from these fields has been surveyed to Madisonville and Greenville, where Missouri-Kansas holds a distribution franchise.

Natural Gas Coming to Modesto and Tracy

The Pacific Gas and Electric Company, San Francisco, Cal., has completed two purchases that will give Modesto, Tracy and their environs the benefits of natural gas. It has brought a controlling interest in the Modesto Gas Company and has also acquired control of the Tracy Gas Company through the purchase of its common stock.

The Modesto Company will, for the present, continue under the direction of Frank A. Cressey, its president and general manager. When the natural gas line now being built up the San Joaquin Valley has been completed, natural gas will be supplied to both the Modesto and Tracy companies, which will, in turn, distribute it to consumers in the areas in which they operate.

Natural Gas Pipe Line Completed

Missouri-Kansas Pipe Line Company recently completed construction of three six-inch pipe lines under the Ohio river from Hawesville, Ky., to Cannelton and Tell City, Ind. Natural gas now will be distributed to these Indiana industrial communities by the Indiana-Kentucky Natural Gas Company, a Missouri-Kansas subsidiary. With the entrance into Indiana, Missouri-Kansas is operating in five states—Kansas, Missouri, Kentucky and Illinois being the other four.

Canadian Gas Association Meeting to be Held in Halifax

The Canadian Gas Association will hold its annual convention at the Lord Nelson Hotel, Halifax, N. S. on June 24th and 25th. Many papers covering subjects of vital interest to gas men will be presented. A fine entertainment program has been provided. Trips of inspection to the new gas plant of the Halifax Company, and to sales division, have been arranged. Special fares on the certificate plan on most railways and boat lines will be accorded to the delegates also special through cars without change from Toronto to Halifax are being arranged for.

Big Gas Merger

The Pacific Public Service Company, San Francisco, has taken over the Natural Gas Corporation of California, Washington and Oregon, all to be operated as subsidiaries of the Pacific Company. Pipe lines will be dispensed with, liquefied gas to be shipped in tank cars and the gas to be carbureted in local plants. More than a dozen cities will use this service.

(News continued on page 88)

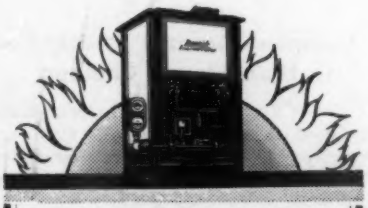
13 KERNIT INCINERATORS SOLD—TO CUSTOMERS

25 KLEENBURN INCINERATORS SOLD—TO CUSTOMERS

These 38 Incinerator Sales

in the FIRST *10 weeks of one activity*

P-R-O-V-E



-that the market is ready to buy
-that the Kernit Line offers real value

THESE facts point the way, for you, to new sales and profitable load building. This 10 week activity started after the company had purchased one Kernit and two Kleenburn Incinerators for testing and floor display. The reorders, every few days since then, speak louder than claims or promises, for they indicate sales and deliveries to consumer-buyers.

These results were secured quickly, with minimum effort, through the use of the Kernit Sales Plan. You can do as well in your territory, and you are only losing profitable sales and the load they bring, by not having the Kernit Plan in operation —now.

The Kernit Line is complete in models, sizes and price range. The Kernit Plan has proved its business building ability. The combination is one you can't afford to pass by.

These

are a few typical Kernit activities just started by leading operating companies

A company serving 231 towns has just put 75 men to work under the Kernit Plan. Another, serving more than 300 towns is starting an activity immediately. Others just started or starting include a company serving 15 towns another one serving 84 towns; another, 9 towns; one, 25 towns; one, 12 towns; one 8 towns; one, 15 towns; and one serving 51 towns. And everyone enthusiastic about the products and the Sales Plan. (Names of Companies on request.)

WRITE FOR THE
KERNIT SALES PLAN—PRICES & DISCOUNTS

KERNIT INCINERATOR COMPANY
MILWAUKEE WISC.

Affiliated with KERNER INCINERATOR COMPANY

Natural Gas Pipe Line from Texas Fields to Chicago Announced

An announcement emanating from Chicago recently, confirmed the rumor and report current for some time that important negotiations had been concluded by the Cities Service, Insull and other interests for the bringing of natural gas from the Panhandle of Texas to Chicago.

It has been known for some time that the Cities Service Co. was developing a project for the carrying of gas from the Southwest fields to Eastern markets. Associated with the Cities Service Company and the Insull Company in this project will be the Texas Corporation, the Phillips Petroleum Company, the Skelly Oil Company, the Columbia Carbon Company and the Standard Oil Company of New Jersey. It is known some of the most substantial reserves of natural gas acreage in the country are in the control of these five companies and the Cities Service Company.

It is expected Henry L. Doherty & Co. will construct the line, and because of their leadership in the natural gas business will, no doubt, furnish the management.

It is possible that a number of other markets besides Chicago in the immediate territory of the line will be served. These markets may include Omaha, Neb., Des Moines and Davenport, Ia., Rock Island and Moline, Ill., and other cities in the states intervening.

It was reported in the Chicago announcement of the project that the initial installation is to consist of a single main with necessary compressor stations. These compressor stations are to be so constructed as to facilitate the laying of a parallel main or mains and they also will be built so that it will be possible to increase the capacity of the pumping stations as additional daily capacity is required.

The Peoples Gas, Light & Coke Company will distribute the natural gas in Chicago, probably as part of its general supply, subject to the approval of the Illinois Commerce Commission. It is expected the Public Service Company of Northern Illinois, the Western United Gas & Electric Company, the Illinois Northern Utilities Company and other utility companies will assume the distribution in their respective territories in Northern and Northeastern Illinois.

Work Started on Natural Gas Mains

Work has been started by the Atlanta Gas Light Company on the natural gas mains at Marrieta, Ga. At the same time, work on securing the right-of-way from the Chattahoochee river to the city limits is progressing rapidly, and work on the main line will, it is expected, be started in the near future.

900 Mile Gas Line Contract to A. O. Smith

The A. O. Smith Corporation, Milwaukee, has been awarded a blanket contract for pipe to build a 900 mile line, one of the largest orders on record in the natural gas industry, according to a recent announcement by the Moody-Seagraves Co., New York.

The 900 mile line is to extend from Stevens county, Kansas, to points in Iowa and Nebraska, according to the report, which stated the Milwaukee concern is to furnish all the pipe needed for the line as well as field welding. Delivery of the pipe started April 1st, it was stated.

The Missouri Valley Gas Co. is to operate the proposed new natural gas system, making a delivery of 100,000,000 cubic feet daily. Missouri Valley Gas has 325,000 acres of producing properties in Texas county, Oklahoma, and in Stevens and Morton counties, Kansas.

A. O. Smith has also just received an order for a 190 mile pipe line to be built for the Pure Oil Co. which followed several other recent large contracts.

The S. R. Dresser Mfg. Co. has received an order for couplings to connect up the 24-inch A. O. Smith welded pipe to be used in construction of the new natural gas pipe line, it was announced.

Natural Gas for Metallurgical Processes

Natural gas will be used in the metallurgical processes of manufacture by the principal subsidiary of the U. S. Steel Corporation, in Birmingham, Ala., under the terms of a contract signed with the Southern Natural Gas Corporation. The contract calls for pipe lines that will provide a maximum of 10,589,600 cubic feet every 24 hours. Additional requirements up to 15,596,100 cubic feet will be supplied by the gas corporation upon request of the Tennessee at any time in the future.

Under the terms of the contract other subsidiaries of the U. S. Steel Corporation in the Birmingham district including the American Steel & Wire Co. will also be furnished natural gas. It is estimated that the annual consumption under the agreement reached will be 4,500,000,000 cubic feet.

Washington State Gets Another Gas Well

The Northwest Natural Gas Company owns and operates seven gas wells within forty miles of Yakima, Washington. Early in March the Miocene Petroleum Company brought in a gas well within four miles of Yakima, the well making 6,000,000 cubic feet of gas daily. The well is only 930 feet deep.

Company Granted Twenty-Year Franchise at Chetopa

The City Council of Chetopa, Kansas, granted the Consumers Gas Company a twenty-year franchise for natural gas. The Company's former franchise in that city expired October 9, 1927.

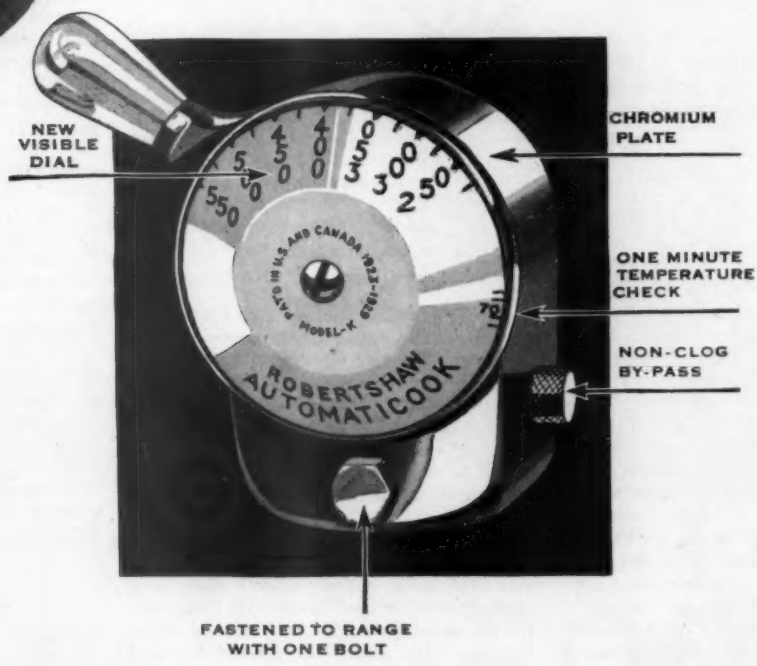
Gas Line To Be Built

Surveyors are laying out the route for the two hundred mile pipe line from Farmington to Albuquerque, New Mexico, for the Southern Union Gas Company which has been given a franchise to serve Albuquerque with natural gas.

Striking Hot Water Window Display

5 FEATURES!

make the "K" Type Robertshaw's greatest AutomatiCook



WHEN the new gas ranges reach you, look for the brand new, greatly improved Robertshaw "K" type AutomatiCook. Examine it. You'll find in the new AutomatiCook selling arguments that will make your ranges move faster.

Five new features—smaller, neater, more compact. There's a fully visible dial. There's a handsome chromium finish. There's a fool-proof One-Minute Temperature Check. A non-clog by-pass. And only *one* bolt holds the whole AutomatiCook to the range! Temperature setting, calibrating and all working parts accessible from outside the range.

We've prepared some descriptive literature of this new AutomatiCook. Write for it now. Study it before your ranges begin to arrive . . . . If you'll send us the names of your employees handling, selling or installing ranges, we'll be glad to send them literature to help sell ranges faster, too . . . Write—*today!*

ROBERTSHAW AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

PERSONALS

George I. Keal has been appointed District General Manager of the gas properties of the American Commonwealth Power Corporation located in New England and lower New York. Mr. Keal will make his headquarters at North Attleboro, Mass.

Joy J. Weien of the Union Public Service Company at Ottawa, has been transferred to Baldwin, Kansas, where he has been made the manager of the company's office there. Mr. Weien will take the place of John Blaney, who has resigned. Mr. Weien has had a wide experience in the operating department as well as the sales department of the company.

C. J. Prashaw, formerly commercial manager of the Jefferson City District, has been appointed supervisory commercial manager for the entire Missouri Power & Light Company properties, succeeding T. C. Brill, who has resigned.

Mr. Prashaw was associated with the Henry L. Daugherty properties in Oklahoma before his connection with the Missouri Power & Light Company. He will have his headquarters at Kansas City, Mo.

Fred K. VanArsdel has recently assumed the duties of Assistant Division Manager of the Northern Division of the Jersey Central Power & Light Company. Mr. VanArsdel is a graduate of Purdue University and was formerly in the service of the Interstate Public Service Company of Indianapolis as an engineer. Later he was transferred to the Kentucky Utilities Company and was local manager of the Paducah District.

Mr. VanArsdel will now make his home in Morristown and will be in charge of commercial activities.

Frederick Bourne of the Gas Distribution Department of the Public Service Electric & Gas Company, Ridgewood, N. J., was presented a McCarter Medal recently for having revived by the prone pressure method of resuscitation a victim of gas asphyxiation.

Arthur Hewitt was elected Vice-President of the Consumers' Gas Company, Toronto, Canada, at a recent meeting of the Board of Directors. He succeeds the late Dr. F. LeM. Grasett. Thomas Bradshaw was elected a director and F. Gordon Osler was appointed a member of the Executive Committee. Edward J. Tucker is now Assistant General Manager.

Harry Siebenthaler, formerly manager of the Carthage, Mo., Gas Company, has been promoted to the position of manager of the Ozark Distributing Company. Mr. Siebenthaler will have charge of all of the Ozark Distributing companies on the new line to Springfield, Mo. The towns which will come under his supervision are Neosho, Marionville, Peirce City, Monett, Aurora, Republic and Billings. He will make his headquarters at Monett, Mo.

Mr. A. H. Maeder has been appointed general superintendent of the Ozark Distributing Company with headquarters at Aurora, Mo. Mr. Maeder was district superintendent of a group of towns operated by the Western Distributing Company and was formerly located at Sedgwick, Kansas.

Ralph D. Ford succeeds Mr. H. Siebenthaler as manager of the Carthage, Mo., Gas Company. Mr. Ford was formerly chief clerk of the Union Public Service Company at Ottawa, Kansas.

Charles August Littlefitz, district foreman at the North Hudson, N. J. Distribution Shop of the Public Service Electric & Gas Company, was awarded a gold button for having completed twenty-five years of service, at a testimonial dinner given in his honor recently.

M. A. Hardie, for several years vice president and general manager of the Houston Gulf Gas Company, and general manager of the Dixie Gulf Gas Company, both subsidiaries of the United Gas Company, has resigned his position, effective at once, and has moved to San Antonio where he will be connected with the Coast Drilling Company, a T. P. Morgan interest.

A native of Pennsylvania, being born at Mount Alton, near Bradford, his first regular field work started in 1895 when as a roustabout with the Carter Oil Company, Hardie went through the boom in West Virginia. He joined the United Natural Gas Company of Oil City, Pa., in 1898, as telegraph operator, and in 1901 was promoted to field superintendent, later leaving to accept a similar position with the Canadian Western Natural Gas Light, Heat and Power Co., Ltd., of Alberta, Canada.

From this company he went to the Producers and Refiners Corporation at Parco, Wyo., where he remained for seven years, resigning to come to Houston.

Guy W. Faller, vice president of the outside properties of the Public Service Company of Colorado has been named to succeed E. Salisbury Smith who resigned as manager of the Colorado department of the Cities Service securities business.

Mr. Faller has been with the Public Service Company for twenty-seven years.

Harold W. Watt was recently appointed to the position of assistant to Vice-President Stuart Wilder of the Westchester Lighting Company. Mr. Watt, who was formerly electrical engineer, succeeds in his new position the late Isaac M. Beatty. Mr. Watt entered the employ of the Westchester Lighting Company in 1908.

George E. McCaffrey, Assistant Superintendent of the Charles Street Plant, of the Fall River, Mass., Gas Works Co., and a member of that company for the past seven years, has resigned to accept a position as Plant Superintendent of the Stamford, Connecticut, Gas & Electric Company, his resignation becoming effective March 2.

From 1919 to 1920, Mr. McCaffrey was employed by the Worcester Gas Light Company. In 1920 he went to work for the Haverhill Gas Light Company and in 1923 he was transferred to Fall River as chemist. In January 1924, he became Chief Chemist and in January 1928, he was made Assistant Superintendent.

B. M. Lester was recently appointed general auditor for the Oklahoma Gas and Electric Company.

Mr. Lester has been associated with the Byllesby organization in the Oklahoma Gas and Electric Company system for the past twenty years.

Ellwood Griest, who had been industrial engineer of the Lebanon (Pa.) Valley Gas Company, The Harrisburg (Pa.) Gas Company and the Consumers Gas Company, Reading, Pa., since August, 1925, has been appointed superviser of industrial gas sales, The Philadelphia Gas Works Company.

Mr. Griest brings to Philadelphia a wide experience in industrial heat application work obtained in the past 14 years since he was graduated from the University of Michigan. Before his connection with the three companies mentioned above he had been in the employ of the Lancaster (Pa.) Gas Light and Fuel Company.

Obituary

SHELDON J. GLASS

The death of Sheldon J. Glass at Milwaukee, April 22, recalls to older men in the gas industry certain valuable contributions he made to the gas industry some 30 years ago by reason of several useful inventions. He originated and patented the first recording meter device to be used principally in the adjustment of consumers' complaints. Another valuable device to be developed by Mr. Glass was the proving meter dial used in gas company meter shops.

Mr. Glass was among the first in the gas industry to vision the practicability of using gas for house heating. As early as 1898 he began to heat his own home with gas.

At the time of his death Mr. Glass was vice president of the Milwaukee Gas Light Company. He had been in ill health for some time and had not been active since

(Obituary continued on Page 92)

APPROVED . . .

BY THE NATION

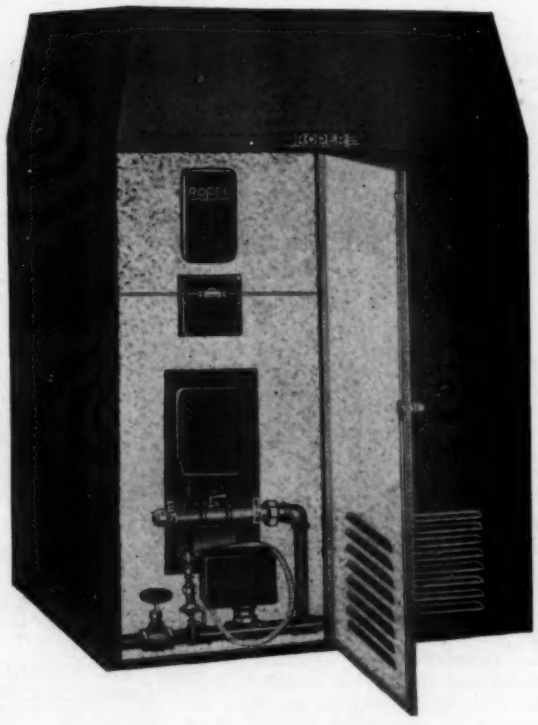
Few products have ever gained quicker nation-wide approval than the Roper Gas Furnace. It has won this approval because of its beauty and—even more important—because it is a gas fired, warm air furnace outstandingly modern in design and efficient in operation.

The Roper came as the result of years of furnace manufacturing experience and a scientific study of house heating problems. It is safe; an automatic thermostat heat control shuts off the heat at a predetermined temperature.

It is made in various sizes on the single-unit-to-a-battery plan; is adaptable to every size of job; can be furnished with or without thermostatic control, automatic humidifier, safety pilot, limit control and fan, etc.

The Roper Gas Furnace is of heavy cast-iron construction and is **A G A** approved. The successful results it has attained mark it as a gas fired warm air furnace that the industry can confidently recommend.

GEO. D. ROPER CORPORATION, Rockford, Ill.



COMPANY MEMBER OF AMERICAN GAS ASSOCIATION

ROPER

GAS FURNACES

SPECIFICATIONS

Roper Furnace	Net Available B.T.U. Per Hour at Bonnett	Free Air Thru Furnace (Sq. In.)	Imput Rating B.T.U.'s Per Hour	Number Burners	Flue Vent Sizes (Diam. In.)	Dimensions Inches		
						Width	Depth	Height
4001	57,500	565	75,000	1	5	22	*44¼	64¾
4002	115,000	1,022	150,000	2	7	44	*40¼	64¾
4003	172,500	1,533	225,000	3	9	66	*40¼	64¾
4004	230,000	2,044	300,000	4	..	88	*40¼	64¾
4005	287,500	2,555	375,000	5	..	110	*40¼	64¾
4006	345,000	3,066	450,000	6	..	132	*40¼	64¾

*Down Draft Diverter adds approximately 18 inches to the depth.

Roper furnaces 4001, 4002, 4003, 4004, 4005, 4006 are fitted for manual control—regularly equipped with main shut-off valve and Bunsen flame pilot. These furnaces can also be furnished with thermostatic control, automatic humidifier, safety pilot, limit control and fan. Finished in crystal green and black.

SHELDON J. GLASS

(Continued from Page 90)

a stroke eight years ago. His death was hastened by a fall a few days before.

Milwaukee had been his home since 1891 when he came here from Chicago. He was born in Genesee, N. Y., April 2, 1855. On March 30, 1882, he was married in Chicago to Miss Elizabeth Bowen.

Mr. Glass took the position of assistant superintendent and purchasing agent for the Gas Company when he came to Milwaukee, and two years later he was elected secretary which position he retained until 1903. In that year he went to New York as secretary and treasurer of the American Light and Traction Company, returning to Milwaukee in 1906 as vice-president and general manager for the Milwaukee Gas Light Company.

JOHN KRUESI

John Kruesi, aged 38, president and general manager of the American Lava Company, died at his home in Chattanooga, March 26, 1930, after an illness of three days.

Mr. Kruesi was born September 3, 1892, and at the time of his father's death in 1899, Thomas A. Edison was named as his guardian. He received his education under the direction of Mr. Edison. Mr. Kruesi was a graduate of Cornell University.

After completing his education, Mr. Kruesi entered the employ of the Detroit Edison Company. In 1920 he came to Chattanooga and became vice-president and manager of the American Lava Company. On January 1st he was elected president and general manager of that company.

Mr. Kruesi was an active civic worker and at the time of his death he was a member of the board of directors of the chamber of commerce, member of the Mountain City club and the Rotary club.

Kernit Incinerator Co. Appoint Walter K. Stafford New England Sales Manager

The Kernit Incinerator Company, Milwaukee, Wisconsin, manufacturers of Kernit and Kleenburn Incinerators announces the appointment of Mr. Walter K. Stafford as New England Sales Manager, Utilities Division for their products. Mr. Stafford's office will be at 53 State Street, Boston, Massachusetts.

Mr. Stafford has been in the gas industry in New England for over twenty years, and has been very active in committee work in the Gas Sales Division of the New England Gas Associatiion for a number of years. During the time that Mr. Stafford represented gas range manufacturers, he was in a large measure responsible for the introduction and development of the insulated gas range.

TRADE NEWS

United Engineers & Constructors, Inc., Activities

The Quakertown, Pa., Gas Company has awarded contract to furnish and install 2700' of 8" welded steel main in Quakertown, Pa.

The Highland Gas Company of Quakertown, Penna., has awarded contract to furnish and install 3300 feet of 4" welded steel main from Broad and Main Streets on Main Street, Quakertown, Penna., to Trumbauersville take-off, Quakertown, Penna., which work will be carried on by the Distribution Department. Also contract to furnish and install 16,300 feet of 4" welded steel main between Trumhauerville, take-off Quakertown, Pa., and Trumhauersville, Penna.

The Allentown-Bethlehem Gas Company has awarded contract to furnish and install 14,600' of 8" welded steel main between Didier, Pa., and Hellertown, Penna. Also to furnish and install 1600' of 12" steel main, Dresser coupled in Bethlehem, Penna.

The Borough of Paulsboro, New Jersey, has awarded contract covering equipment for the No. 1—5' set, in order to use bituminous coal as generator fuel. The set will also be equipped with the Backrun.

The Jersey Central Power and Light Company of Asbury Park, N. J., have authorized the installation at the gas plant at Ocean City, N. J., of a new 7' generator with necessary castings, linings, changes to operating floor, dismantling and foundation changes.

The Public Service Company of New Hampshire, Manchester, N. H., has awarded contract for the installation at Keene, N. H., of one (1) 6' 0" U. G. I. Carburetted Water Gas Apparatus, with Chrisman Cycle, complete hydraulic operation, take off main, operating floor and motor driven exhauster unit.

Charles T. Aaron Elected Executive Vice-President of the Beckwith Company

Mr. Charles T. Aaron, who was recently appointed General Manager of the Beckwith Company, Dowagiac, Mich. has been made a Director of the company and elected Executive Vice-President and General Manager.

Surface Combustion Co. Occupy New Offices in Pittsburgh

The Surface Combustion Company of Toledo announces that, effective May first, the Pittsburgh branch of the company and the office of the Mantle Recuperator Division will be consolidated and will occupy new offices at 617-619 Henry W. Oliver Building.

The Mantle Engineering Company was purchased by the Surface Combustion Company last year but up to the present time they have been located in their old office at 426 Oliver Building. The present office of the Surface Combustion Company is at 966-968 Union Trust Building.

There will be no change in personnel, Mr. A. L. Hollinger remaining Pittsburgh manager for S. C. industrial equipment and Mr. G. D. Mantle in charge of recuperator sales.

Stacey Engineering Co. Announce Opening of New York Offices

The Stacey Engineering Company announce the opening of their consolidated New York offices in the Graybar Building at 420 Lexington Avenue, New York City.

The Stacey Engineering Company was formed sometime ago and is the holding company for the Connersville Blower Company, P. H. and F. M. Roots Company, Wilbraham Green Blower Company and the Stacey Brothers Gas Construction Company.

These new offices are ideally located and the combined office will be in a better position to continue to render the usual fine service to the gas industry.

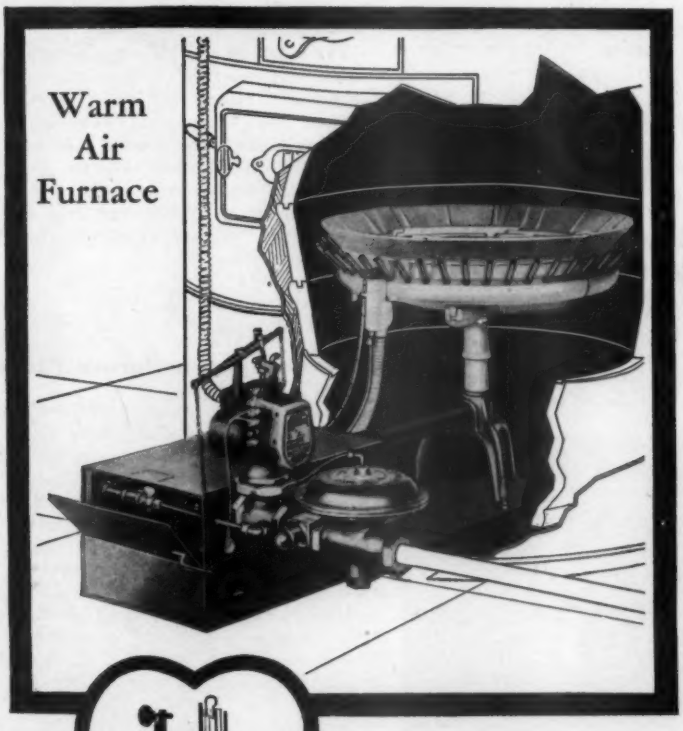
There will be no change whatsoever in the personnel.

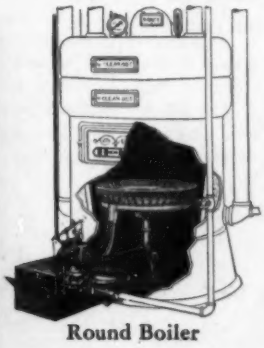
New Armco Culvert Catalogs

"Armco Culverts and Drainage Products" is the title of a catalog issued by the Armco Culvert Manufacturers Association, Middletown, Ohio, listing and describing the complete Armco line of drainage products which includes corrugated iron pipe, perforated iron pipe, part circle culverts and automatic drainage gates. Directions for installation include instructions for using the Armco Jacking Method of creating openings under streets and railroads and through high fills.

Another bulletin entitled "Reducing the Cost of Culvert Placement" is also issued by Armco Culvert Manufacturers Association, Middletown, Ohio, describing the Armco Jacking Method of installing corrugated metal pipe and conduits. By the use of this method openings can be quickly made under streets and railroads without any interruption to traffic or damage to the street or roadbed.

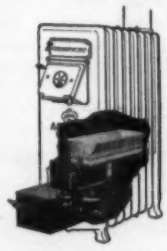
(Trade News Continued on Page 94)

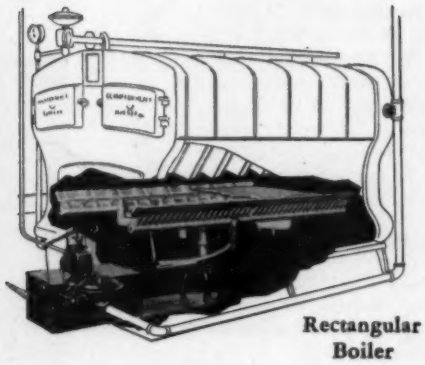




Round Boiler

Arcola-Type Heater





Rectangular Boiler

THE HEART OF THE MACHINE

The COLUMBIA Air Cooled Safety Pilot has no adjustments, is insulated with lavite material, has tungsten points and is movable with Burner Head. A flexible tube conducts cool, cellar air around mixing tube and thermal unit so that it is unaffected by variable ash-pit or fire-box temperatures and oxidation and carbon formation are prevented.

for all kinds of Heating Equipment..

You know what your gas for house-heating costs you to produce but the profit you realize on your heating load is largely determined by the Conversion equipment you recommend.

The COLUMBIA costs less to install and requires no servicing after installation. One Duct Base Assembly fits all sizes of Burner Heads, both round and rectangular. Flexibility of rectangular Burner Head permits expansion to any width from 17" to 38". COLUMBIA standardization eliminates necessity of large stocks. Bunsen Jets impinge flame on fire-box providing maximum heat transfer. Special cooling system insures high fire-box temperature with low ash-pit temperature. Factory tests under both gas and electricity, lack of premixer and freedom from baffle replacements eliminate service expense.

Build your heating load with less installation and service overhead and a larger net profit. You can do it with the COLUMBIA. Let us prove it.

The Columbia Burner Company,
1645 Dorr Street, Toledo, Ohio

He works without wages, is always on the job and gives the customer maximum heat at minimum cost. He is the COLUMBIA Burner.

COLUMBIA advertising and sales helps are as distinctive as the Burner itself. A complete consumer campaign, including life-size cut-outs of the Phantom Fireman and other floor and window display material, folders, newspaper ads, mats, etc., are ready for your use. Portfolio showing these COLUMBIA sales helps sent on request.

COLUMBIA Gas Burner

THE GEM OF THEM ALL

Alexander Milburn Appoint Chicago Representative

Mr. Charles R. Pollard, identified for many years with the home office of the Alexander Milburn Company, Baltimore, Maryland, has been appointed Chicago District Representative, taking over the supervision of the Chicago District Office, 220 South State Street.

Bailey Meter Co. Move Chicago Offices

The Bailey Meter Company, 1050 Ivanhoe Road, Cleveland, Ohio, announces that it has transferred its office in Chicago, Illinois, to 20 North Wacker Drive Building. R. V. Knapp continues as branch Manager in this territory where he is assisted by a staff of mechanical engineers specializing in metering control and combustion problems.

New Electrolux Distributors

Electrolux Refrigerator Sales, Inc., Evansville, Indiana, announces the appointment of the following companies to handle their products:

Distributors—Palestine Light, Heat & Power Co., 109 W. Oak St., Palestine, Tex.; Economy Gas Service Co., 1710 Forbes St., Pittsburgh, Pa.; Union Gas Corporation, Independence, Kansas; Natural Gas Distributing Co., Hebron, Nebraska; Central Power Company, Hastings, Neb.; Missouri Natural Gas Co., Popular Bluff, Mo.; Taschner Plb. & Htg. Co., 512 Kentucky Ave., Paducah, Ky.; J. A. Bowen, Roslyn Hotel Bldg., Main St., Greenville, Miss.; Carolina Central Gas Co., 144 West Third Ave., Hendersonville, N. C.; Utilities Purchasing & Supply Co., 412 Washington St., Reading, Pa.

Dealers—G. W. Zink, Roswell, N. M.; Donehoe-Ware Hdwe. Co., Plainview, Tex.; Sitter Furniture Co., McLean, Tex.; N. M. W. Store, Higgins, Tex.; Stanton Hdwe. Co., Stanton, Tex.; L. L. Collins Co., Dougherty, Tex.; Thompson Hdwe. Co., Canyon, Tex.

Blower Company Moves Sales Offices

The Connersville Blower Company, Inc., of Connersville, Indiana, has moved its Chicago Sales Office to Room 1428, No. 20 North Wacker Drive.

Also, after May 1st, the New York Sales Office of the company will be located at Room 533 of the Graybar Building, 520 Lexington Avenue.

Cutler-Hammer Change Location of Detroit Office

The Detroit District Sales Office of Cutler-Hammer, Inc., manufacturers of electric control apparatus is now located at 2755 East Grand Boulevard, Detroit, Michigan.

The new location includes warehouse facilities where stocks of standard C-H motor control, wiring devices, safety switches and other C-H products will be carried for immediate delivery.

A. F. Pistor Takes Charge of Inertol Plant at Newark

The Inertol Company of New York announces the appointment of A. F. Pistor, PhD., as Manager of their factory and research department in Newark, N. J. Dr. Pistor is the author of several articles

Dr. A. F. Pistor

on gas methods. The company manufactures Imunol for protecting Gasholders.

Cutler-Hammer Purchases Union Electric Manufacturing Co.

Announcement is made by Cutler-Hammer, Inc., Milwaukee, Wis., that it has purchased the assets of Union Electric Manufacturing Co., also of Milwaukee, manufacturers of Motor Control specializing in a complete line of drum type control apparatus.

The addition of the Union line to that of the Cutler-Hammer line enables Cutler-Hammer to supply any requirement of its customer in drum type motor control apparatus.

The branch sales offices and warehouse stocks of Union will be consolidated immediately with the Cutler-Hammer branch offices and warehouses. The present factory of Union will be operated as a manufacturing division of Cutler-Hammer. Mr. E. F. Le Noir, President of Union, will become a member of the headquarters sales staff of Cutler-Hammer. Most of the Union personnel, particularly those in the Sales and Engineering Departments, will also join the C-H organization.

Consumers Power Company Award Contract to Koppers Co.

The Consumers Power Company has awarded a contract to the Koppers Construction Company for an addition to its Becker oven by-product coke and gas plant at Jackson, Michigan. The new installation will include eleven producer gas heated Becker ovens with an annual coal capacity of 35,000 tons and a daily gas output of approximately 1,200,000 cubic feet.

New Conversion Burner Catalog

The Roberts-Gordon Appliance Corp., Curtiss Building, Buffalo, New York, recently issued a booklet entitled, "Sell Health and Comfort in the Home." It describes the Roberts controlled gas heating unit for converting coal-burning, hot water, steam, vapor boilers and warm air furnaces into gas burning equipment. It also contains several selling plans with proofs of newspaper mats, duplex mailing pieces in colors and a complete plan for merchandising effort. It is attractively printed and a copy will be mailed on request.

Tagliabue Co. Plan Removal to Larger Quarters

The C. J. Tagliabue Mfg. Co. of Brooklyn, N. Y., manufacturers of instruments, recently announced the acquisition of the American Tobacco Company property on Park Avenue in Brooklyn.

From a great manufacturing plant in Bush Terminal, the company enlarges to more than double its present facilities in its projected removal to Park Avenue. The new building, a model of the latest industrial construction, will be occupied about the first of July. It is a five story, basement and pent house, modern concrete, fire-proof structure. The plot measures 200 x 234 feet and the building provides approximately 300,000 square feet of working floor space with lofty 14 foot ceilings and modern steel sash making it unusually light. Scientific arrangements have been made in planning the various manufacturing departments.

Restaurant and hospital facilities will be provided for the well being, comfort and health of employees.

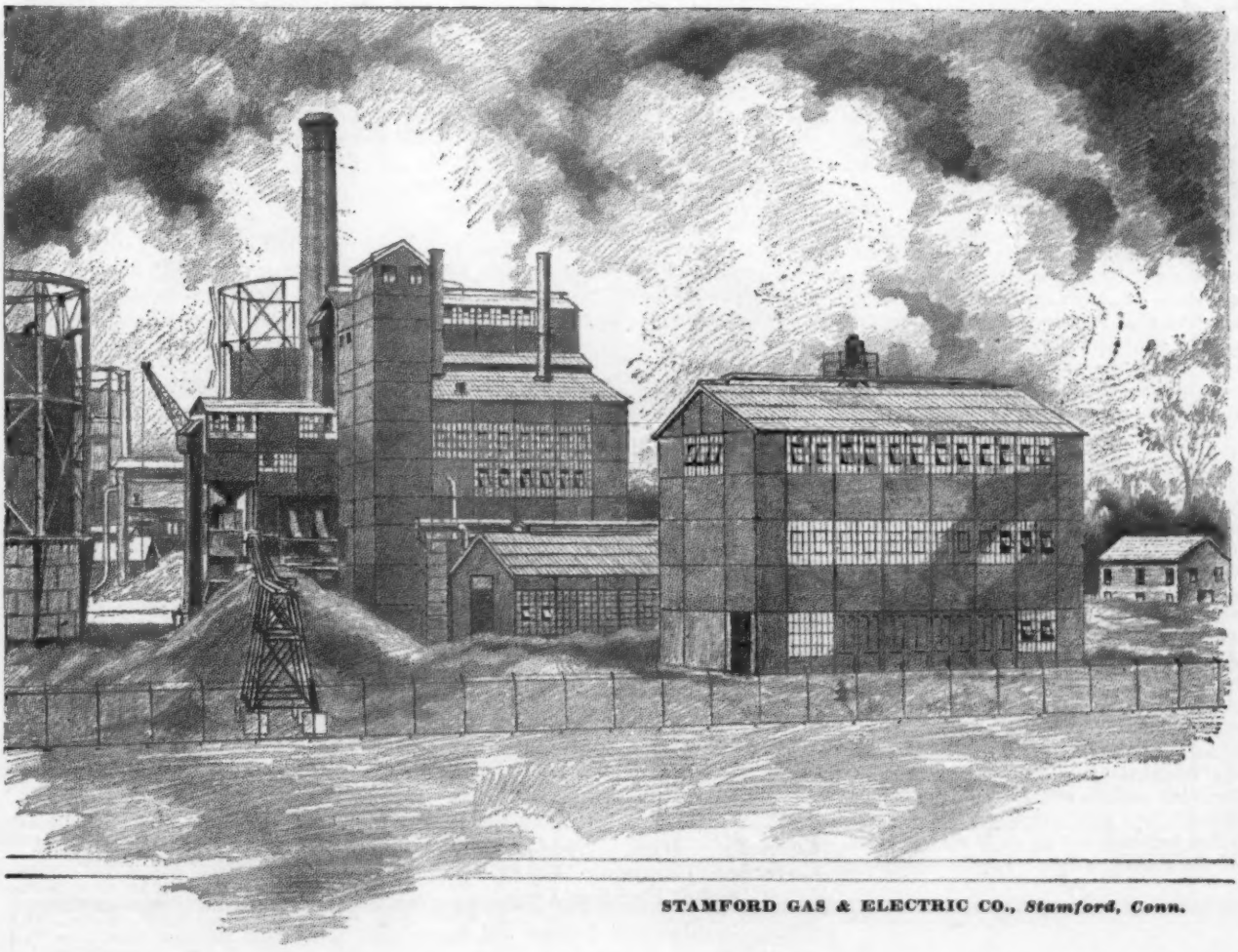
A large modern cafeteria will be located on the third floor for the general office and factory employees.

The completely equipped hospital is to be conveniently located on the first floor easily accessible to the entire plant.

The general location of the building itself is fortunate as it is within easy accessibility of rail centers and steamship docks.

The laboratories and experimental divisions have been given a general allottment of space.

(Trade News Continued on Page 96)



STAMFORD GAS & ELECTRIC CO., *Stamford, Conn.*

Another— Gas Utility Produces Its Base Load With Coal Gas.

Glover-West Vertical Retorts, with a daily capacity of 1,100,000 cu. ft., were installed at Stamford in 1926. This is the plant where the A. G. A. Carbonization Committee conducted the tests for their report at the 1927 convention.

The design of Glover-West Retorts is such that you get maximum yields of gas, coke and tar with minimum operating costs.

Other Glover-West Installations

Fitchburg, Mass.
Springfield, Mass.
Portland, Me.
Ottawa, Ont.
Vancouver, B. C.
Victoria, B. C.
Watertown, N. Y.
Malden, Mass.
Fargo, N. D.
Toronto, Ont.
Santos, So. America
Pernambuco, So. Amer.
Santiago, So. America
Buenos Aires, So. America
Pawtucket, R. I.
Fall River, Mass.
Faribault, Minn.
Halifax, N. S.
Belleville, Ont.
Rio de Janeiro, So. America

WEST GAS IMPROVEMENT COMPANY, 441 Lexington Ave., New York

Builders of Coal Gas Plants

Glover·West
VERTICAL·RETORTS

Paul J. Kruesi Elected President of the American Lava Corp.

The American Lava Corporation of Chattanooga, Tennessee, at a directors meeting held on April 7, 1930, elected Paul J. Kruesi, President to succeed John Kruesi, deceased.

Paul J. Kruesi is also President of the Southern Ferro Alloys Company of Chattanooga and a manufacturer of national reputation. Among other honors, he has served as President of the American Electro Chemical Society. He is the founder of the American Lava Corporation and his election insures the continuance of the progressive management which the company has enjoyed since it was established.

New Catalog Describes Brown Remote Type Instruments

The Brown Instrument Company, Philadelphia, Pa., have just issued Catalog No. 7501 describing Brown Remote Type Instruments. This Catalog is of standard size 7¾" x 10½" and is fully illustrated in two colors throughout the 32 pages, the illustrations showing in detail how the various instruments operate. Sectional views and wiring diagrams amplify the descriptive material. These Remote Type instruments will furnish needed data instantly and accurately from distances of a few hundred feet up to 30 miles. Copy of the catalog will be mailed on request.

New Quigley Bulletin

The Quigley Furnace Specialties Company, 56 West 45th St., New York City, have just issued a new bulletin entitled "Hytempite in the Power Plant." This bulletin features the uses of this product for boiler settings, baffles, special shapes, repairs, etc. The method of making inclined or vertical Monolithic Baffles with crushed firebrick and Hytempite is fully described, as well as the use of the Quigley Refractory Gun for furnace walls and arches and for building and repairing baffles. The catalog is printed in two colors, freely illustrated and contains a fund of useful information. Copy will be sent on request.

General Refractories Co. Appoint Dealer

The General Refractories Company has appointed Harry N. Crowder, Jr. Company, of Easton, Pa., as their exclusive High-Temperature Cement Dealer in Lehigh and Northampton counties in the State of Pennsylvania, and also including those portions of Warren and Hunterdon counties in New Jersey, adjacent to the Delaware River between the towns of Belvidere and Milford. This dealer will handle Grefco High Temperature Cement and Standard Silica Bonding Cement.

Furnace Manufacturer Plans Quarter Million Dollar Expansion

A $250,000 expansion program which includes the extension of the present factory and office buildings and the purchase and remodeling of 5 acres of adjoining property has recently been announced by Mr. Frank H. Adams, Vice-President and General Manager of the Surface Combustion Co., Inc., whose main offices and works are located at 2375 Dorr St., Toledo, Ohio.

The company which is a subsidiary of Henry L. Doherty & Company moved from New York to Toledo in 1927. Since that time, the demand for industrial and domestic heating equipment has grown rapidly, necessitating greatly increased manufacturing capacity. In 1929 approximately 50,000 square feet of floor space was added to the plant. With the acquisition of the new property and the enlargement of the present buildings Surface Combustion will now have 9 acres of land and 4 acres of floor space.

The Development Department in which research on new equipment and investigation of furnace design is being carried on continually is to have a separate building approximately doubling the space occupied at present. This department will have at hand every facility required for its staff of thirty-two engineers.

Connelly Iron Sponge and Governor Company Takes Over Cabot Purifier Tray

The Connelly Iron Sponge and Governor Company, Elizabeth, N. J. have recently taken over the business of John Cabot, well known maker of purifier trays for over fifty years. The Connelly Company announce that these trays will be kept up to the high standard set by Dr. Cabot.

Moeller Instrument Co. Succeeds A. E. Moeller Co.

A. E. Moeller Co., of 261 Sumpter St., Brooklyn, N. Y., has been succeeded by the Moeller Instrument Company, Inc., according to a recent announcement.

The active ownership and management will remain the same as for many years past under the following personnel: Charles E. Moeller, President and General Manager, Max E. Moeller, Vice-President and Head of Research Department, Curt F. Moeller, Treasurer and Factory Manager, Paul G. Moeller, Secretary and Charge of Sales Department, Otto J. Moeller, Asst. Treasurer and Glass Production Department and Walter G. Moeller, Production Department.

Koppers Company Located in New Offices in New York

The new offices of The Koppers Company, The Koppers Construction Company, The Koppers Erecting Corporation, American Tar Products Company, Inc., American Tar Products Company of New England, Western Gas Construction Company, are now located in the Lincoln Building, 60 East 42nd Street, New York, N. Y.

Circular Describes Mettler Burners

A new circular was recently issued by the Lee B. Mettler Company, 406 South Main St., Los Angeles, Calif., giving information on the use of Mettler Burners in house heating installations, converting coal and oil fired steam, vapor or hot water boilers and warm air furnaces to gas.

STATEMENT OF THE OWNERSHIP, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of American Gas Journal, Published Monthly at New York, N. Y., for April, 1930.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared S. G. Krake, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the American Gas Journal and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, American Gas Journal, Inc., 53 Park Place, New York; Editor, H. M. Riley, 53 Park Place, New York, N. Y.; Managing Editor, H. M. Riley, Douglastown, N. Y.; Business Manager, S. G. Krake, 53 Park Place, New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)
S. G. Krake, 53 Park Place, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

S. G. KRAKE,
Manager.

Sworn to and subscribed before me this 4th day of April, 1930.

[Seal.] Rozella Bennett.
(My commission expires March 30, 1931.)

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs

SUPERIOR METER CO.
167-41st Street
Brooklyn, N. Y.

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD
has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE!

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY
1439 BRANDYWINE STREET - - - - - PHILADELPHIA, PA.

CE-CO Technical Paints

Do Double Duty

CE-CO Gas Holder Paints make holders of all types attractive and defeat rust and corrosion.

In this respect CE-CO scientifically prepared paints pay large dividends in prolonging the life of the structure and at the same time making it more pleasing.

There is something more behind CE-CO Paints than a mere name and a product. There is over half a century of knowing what the gas industry needs to protect the good, hard earned dollars invested in Holders and other metal structures.

Many of the foremost gas companies place complete dependence in CE-CO Technical Paints for the protection of their holders and other metal structures, realizing that they will keep them in the best state of preservation and trim looking for the longest period of time, under every imaginable condition of climate and exposure to chemical action.

Begin today to "slick up" and protect the gas property throughout—Send for further details and color card No. 3-A.

TECHNICAL CE-CO PAINTS

Cheesman-Elliot Company, Inc.

Established 1876

TECHNICAL PAINT MAKERS

639-647 Kent Avenue, Brooklyn, N. Y.

Works at Brooklyn, N. Y. and Williamsport, Pa.

TRADE CATALOGS

Published by manufacturers of Gas Equipment and Appliances for you. Order by number, using coupon on Page 106.

PLANT EQUIPMENT

A. B. C. SELF CLINKERING GENERATOR
The Western Gas Construction Co. 88

"AMERICAN" GAS AND METER TESTING APPARATUS
American Meter Co. 320

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Connelly Iron Sponge & Governor Co. 290

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COKE FIRED GAS PRODUCER OPERATION
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CONTINUOUS VERTICAL COMBINATION OVENS
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COUNTER BALANCE MANHOLES
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The Pressure Won't Matter!

This McWANE 2-inch cast iron gas main is going in to operate under medium pressure now. Later, if it is stepped up to 50 lbs. it will not matter: the pipe is corrosion-proof because it is CAST IRON; and the joints are McWane threaded joints, without couplings.

No Coddling

This McWane main calls for no coddling or coating. Being cast iron, it CAN'T rust. It can be laid and forgotten.

No Leaks

In small sizes, from 1¼ inch up through 2, 4, 6, and 8 inches, this McWane cast iron gas pipe, equipped with gas-tight recess-threaded joints, meets a long-felt need for joints that can be easily and economically made and that will not leak. It is recommended — with FLEXPAN expansion joints at intervals — for all pressures to 100 lbs.

Laying 2-inch McWane Screw Joint Cast Iron Gas Pipe

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McWane cast iron gas pipe affords you not only low cost per foot, but the LOWEST cost per year, for only CAST IRON pipe serves so long and well.

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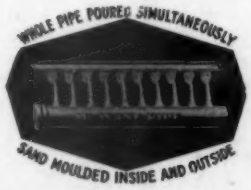
This long life is due to the well-known ability of cast iron pipe to withstand corrosion, plus the superiority of the McWane casting processes in producing a very strong, resilient, close-grained gray iron; that bends before breaking. Being sand-cast too, it cuts, taps, and ships remarkably well. Pipe furnished B. & S., plain-end, threaded, or FLEXPAN joint types.

FLEXPAN Joints with which McWane gas pipe from 2 to 12 inches is also equipped are the ideal joint for all pressures—low, medium, or high. A factory-made B. & S. type joint of unique construction.



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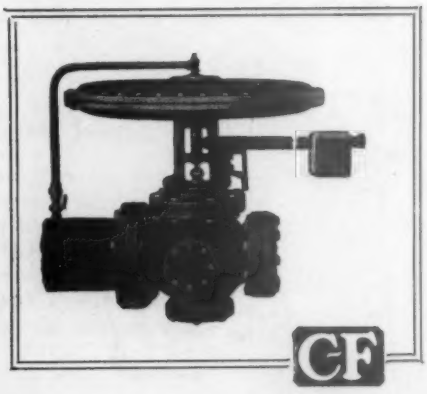
McWANE
CAST IRON PIPE

Efficient Regulation



The Fulton

Low Pressure Regulator

Efficient regulation depends upon the accuracy of the regulation equipment. For more than 40 years, the Chaplin-Fulton Manufacturing Company has made regulating devices for the gas industry. That the aim to make the most accurate and reliable equipment possible has been reflected in the Chaplin-Fulton series of regulators, is evidenced by their popularity and standing with the foremost gas companies.

For an investment in efficient regulation, the following Chaplin-Fulton Regulators offer you the most that can be built into devices for these purposes.

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Low Pressure Regulators

House Regulators

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RIGIDLY inspected at every step in its manufacture, each Pittsburgh Seamless Pipe and Tube must pass a final test before it is judged worthy of "Pittsburgh" standards. In the hydrostatic machine it must withstand a tremendous pressure far beyond its rated capacity and greater than any requirement it will be called upon to withstand in actual service.

Twenty-five years of specialization in the manufacture of steel pipe and tubing exclusively stand behind every length of Pittsburgh Seamless as a guarantee of safety and serviceability.

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New York Tulsa Detroit Chicago
Pittsburgh St. Louis Houston

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LINE PIPE CASING DRILL PIPE TUBING

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Jack through with

ARMCO Corrugated Iron PIPE

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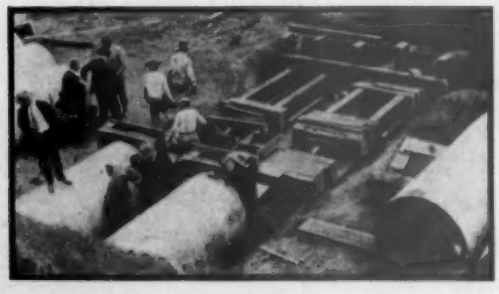

Visiting engineers inspect the layout for an Armco Jacking job under the tracks of a western railroad.

THE Armco Jacking Method is fast supplanting open trenching—even where it is practicable (though unduly expensive) to tear up the surface. The new method, developed by Armco, saves 30 to 50 per cent of the costs of installation by old-fashioned methods.

But installation economy is only *one* reason for the growing popularity of the Armco Jacking Method. When Armco Corrugated Iron Pipe is jacked through there is no danger of settling, hence no hazardous sag in the pavement. Traffic continues without interference while jacking goes on underground. Costly slowing up of trains is eliminated. . .adjoining property is not endangered or injured.

Armco Corrugated Iron Pipe, with a 24-year service record (unequalled by any other corrugated pipe) means an installation that is durable and free from maintenance costs.

Armco engineers, specializing in the solution of drainage and installation problems are at the service of any gas or public utility company requiring openings under city streets for conduits or distribution mains. Data on the Armco Jacking Method will be sent on request. Write.

ARMCO

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

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A 50% SAVING in JOINTS

—with NATIONAL DOUBLE LENGTH PIPE

HERE IS another NATIONAL advantage that means a real worth while saving to gas companies—the use of NATIONAL Double Length Pipe for distributing mains. Double length pipe cuts the number of joints to about one-half . . . reduces leakage and means a considerable saving in time, labor and joint-making materials.

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Remember, NATIONAL is the only lap-welded pipe made in double lengths—another reason why it is

America's Standard Wrought Pipe

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MITCHELL

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Especially adaptable to the screening of coal and coke. In the re-screening of coke, the terrific vibrations, occurring 3,600 times a minute, remove all breeze at the lowest cost per ton. It requires minimum floor space and head room. It is self-contained, dust and water proof. Requires less than ¾ H. P. per standard screen.

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is noted for its maximum yield of high B. T. U. and residual marketable coke.
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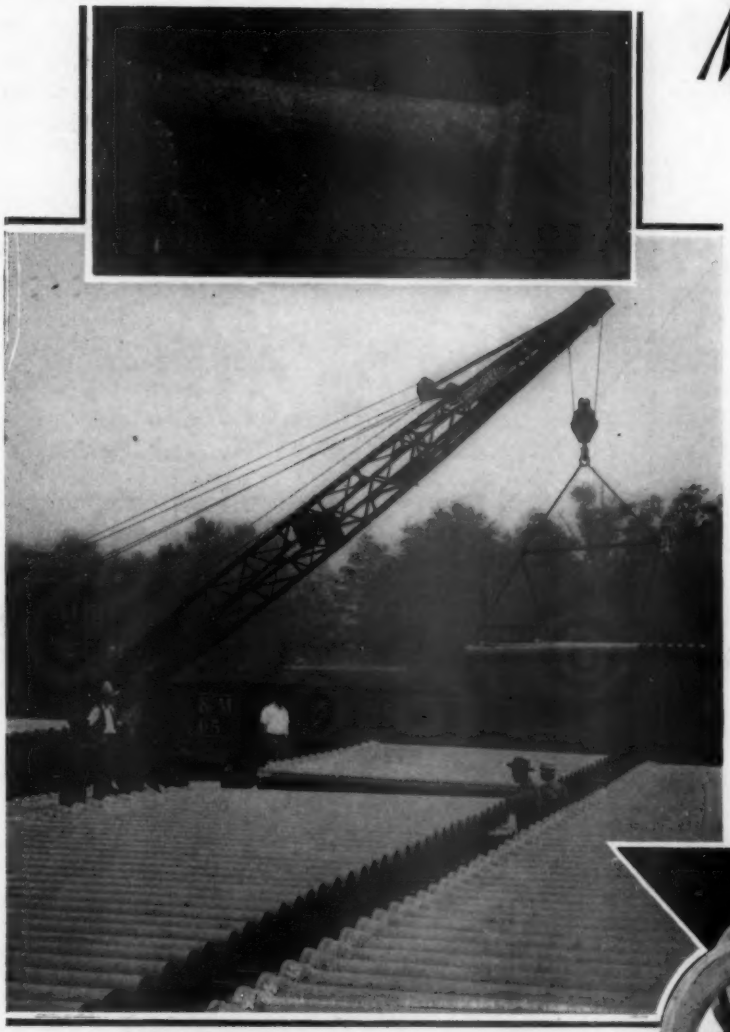
and Rubber Ring Joints Give Permanent Gas Main Construction



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Top view shows a 3" cast iron gas main uncovered in the streets of Washington, D. C. and as good as new after 59 years of service. Center is a loading crane in operation at one of the Clow-National foundries. Right is one type of rubber ring used to make gas joints.

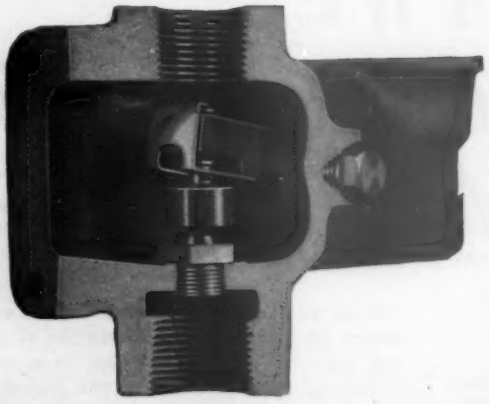
CLOW CHICAGO

CLOW-NATIONAL
CAST IRON PIPE

National BIRMINGHAM

"Everything for a Pipe System"

GROBLE
REGULATORS & GOVERNORS



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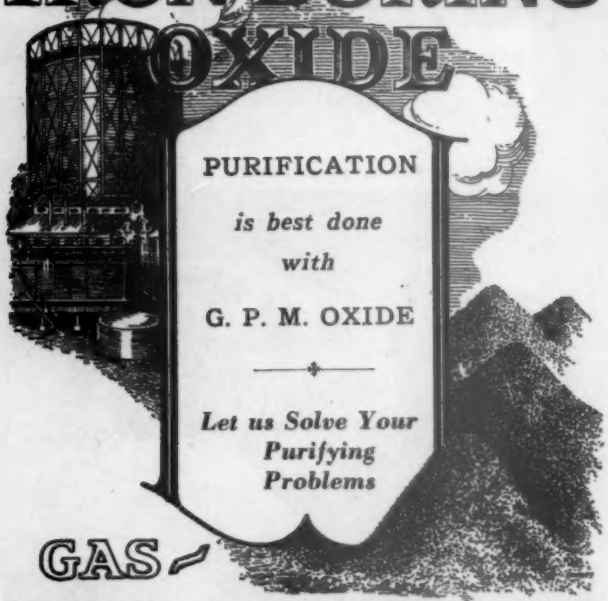

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(*Continued from page 104*)

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RANGE CATALOG—SMOOTH TOP GAS RANGES
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RANGE CATALOG—ACORN GAS RANGES
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RANGE CATALOG—VULCAN HEAVY DUTY COOKING EQUIPMENT
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Geo. D. Roper Corpn. 288

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GAS WATER HEATERS
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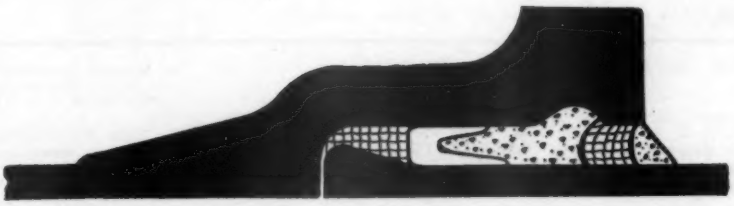

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Indugas, Inc.
The Koppers Construction Co.

BENZOL RECOVERY PLANTS
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Smoot Engineering Corp.
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Smoot Engineering Corp.
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Lambert Meter Co.
D. McDonald & Co.
Reynolds Gas Regulator Co.
Low Pressure
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Lambert Meter Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.
Retort House
Isbell-Porter Company.
Station

GRATES for Water Gas Generators
Semet-Solvay Engineering Corp.
The Western Gas Construction Co.

GRAVITOMETERS
Precision Thermometer & Instrument Company.

GRIDS, for Scrubbers
Semet-Solvay Engineering Corp.
The Western Gas Construction Co.

GUN-REFRACTORY
Quigley Furnace Specialties Co.

HEATERS
Feed Water
Andale Company.
For Oil
Andale Co.
American Gas Products Corp.
American Stove Company.
Homestead Heater Company.
Kompak Company.
Roberts-Gordon Appliance Corpn.
Welsbach Company.
Welsbach Company.

HIGH CAPACITY METERS
Lambert Meter Co.

HOISTS
The Gas Machinery Co.
C. W. Hunt Co., Inc.
The Western Gas Construction Co.

HOLDERS
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
Riter-Conley Company.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
The Western Gas Construction Co.

HOPPERS—COAL AND COKE
Bartlett-Hayward Co.
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
Riter-Conley Company.
The Stacey Mfg. Co.
The Western Gas Construction Co.

HIGH PRESSURE STORAGE
Cruse Kemper Co.
Stacey Bros. Gas Construction Co.
Stacey Mfg. Co.

HOWARD AUTOMATIC CHARGERS
The Western Gas Construction Company.

HYDROGEN GAS APPARATUS
Bartlett-Hayward Co.
Cruse Kemper Co.
Gas Engineering Co.
Improved Equipment-Russell Engineering Corp.
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The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Co.

HYDROGEN SULPHITE TEST (Apparatus)
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HYDROMETERS
The Brown Instrument Co.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.

INCINERATORS, GAS-FIRED
Kernit Incinerator Co.

INDUSTRIAL GAS MIXERS
The C. M. Kemp Mfg. Co.
Roberts-Gordon Appliance Co.
Smoot Engineering Corp.

INDUSTRIAL TRACK
C. W. Hunt Co., Inc.

IRON BORING OXIDE
Gas Purifying Materials Co., Ina.

IRON SPONGE
Connelly Iron Sponge & Governor Co.

IRONERS (Gas Heated)
Hurley Machine Company.

INSTRUMENTS
Alpha-Lux Company
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Lambert Meter Co.
Metric Metal Works.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.
Time-O-Stat Controls Co.

INSULATION
Insulating Cements
Refractory & Engineering Corpn.

PACKING FIBRE
Refractory & Engineering Corpn.

PENTANE
Philfuels Co.

PROPANE
Philfuels Co.

JOINTS (Pipe)
S. R. Dresser Mfg. Co.
Southwestern Pipe Joint & Eng. Co.
United States Pipe & Foundry Co.
Insulating
United Engineers & Constructors, Inc.
Victaulic Co. of Amer.

JOINT RUNNERS
Safety Gas Main Stopper Co

LAUNDRY STOVES
Geo. D. Roper Corp.

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Reduces drip pumpage. Eliminates leakage from pipe expansion and contraction by stabilizing the temperature of the pipe. We build coolers to reduce gas temperatures to as close as within 5 degrees of the cold water temperature and with small cooling water requirements.

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Positively the last word in the practical and efficient combustion of the gases in which air and gas are mixed to the highest degree of perfection. Easily and quickly installed. Can be used on any coal-fired boiler or hot air furnace.

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Tanks, Barges, Pipe, Transmission Towers

and Plate Work

General Offices:- PITTSBURGH, PA.

OFFICES IN PRINCIPAL CITIES

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LAVA PILOT TIPS
American Lava Corp.
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LIQUEFIED PETROLEUM GASES
Philfuels Co.
LOCKERS
Remington Rand Co.
LOOSE LEAF EQUIPMENT
Remington Rand Co.
LUGS—SOLDERING
Wolverine Tube Company.
LUX MATERIAL
Alpha-Lux Company.
LUX SPONGE
Alpha-Lux Company.
MANILA AND WIRE ROPE
C. W. Hunt Co., Inc.
MANOMETERS
American Meter Co.
Brown Instrument Co., The
Precision Thermometer & Instrument Company.
MANTLES
Welsbach Company.
MASKS—GAS
Safety Gas Main Stopper Co.
MAST & GAFF OUTFITS
C. W. Hunt Co., Inc.
MEASURING CHUTES
C. W. Hunt Co., Inc.
MECHANICAL GENERATORS for Water Gas App.
United Engineers & Constructors, Inc.
The Western Gas Construction Co.
METER CONNECTIONS
American Meter Co.
Bartlett-Hayward Co.
S. R. Dresser Mfg. Co.
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Pittsburgh Equitable Meter Co.
Superior Meter Co.
METER REPAIRING
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
METER TESTER, Hydro-Pneumatic
American Meter Co.
METERS
American Meter Co.
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Pittsburgh Equitable Meter Co.
Air
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Connersville Blower Co., The
The Gas Machinery Co.
Lambert Meter Co.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
United Engineers & Constructors Inc.
The Western Gas Construction Company.
Artificial
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Connersville Blower Co., The
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The P. H. & F. M. Roots Company
The Sprague Meter Co.
Superior Meter Co.
Demand
American Meter Co.
Brown Instrument Co.
Connersville Blower Co., The
Lambert Meter Co.
The P. H. & F. M. Roots Company.
Superior Meter Co.
Demonstration
District
American Meter Co.
Connersville Blower Co.
Dry
American Meter Co.
Connersville Blower Co.
Lambert Meter Co.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
Exhibition
American Meter Co.
High Pressure Natural Gas
American Meter Co
Brown Instrument Co.
Connersville Blower Co., The
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The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
Orifice
American Meter Co.
Positive
The Sprague Meter Co.
Prepayment
American Meter Co.
The Sprague Meter Co.
Superior Meter Co.
Proportional
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Brown Instrument Co.
Connersville Blower Co., The
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Wet Test
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American Meter Co.
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Semet-Solvay Engineering Corp.
Smoot Engineering Corp.
MOISTURE DETERMINATORS
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OFFICE FURNITURE
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Andale Co.
ORE, CHROME
E. J. Lavino & Co.
General Refractories Co.
Quigley Furnace Specialties Co.
ORIFICE METERS
American Meter Co.
OVENS (BAKERS)
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OVENS, COKE AND GAS
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Indugas, Inc.
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OXIDE
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
Gas Purifying Materials Co., Inc.
E. J. Lavino & Co.
OXYGEN
Linde Air Products Co.
OXYGEN AND HYDROGEN METERS
American Meter Co.
Lambert Meter Co.
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PAINTS
Cheesman-Elliott Co.
Inertol Co., Inc.
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The Stacey Mfg. Co.
Wailes Dove-Hermiston Corp.
Metal Protective
Semet-Solvay Co.
PAINTS, ANTI ACID AND ALKALI
Cheesman-Elliott Co.
Quigley Furnace Spec. Co., Inc.
PAINTS, RUSTPROOF
Cheesman-Elliott Co.
Inertol Co., Inc.
Quigley Furnace Spec. Co., Inc.
PHOTOMETERS
Connelly Iron Sponge & Governor Co.
PILOTS-SAFETY
Spencer Thermostat Co.
PIPE
Waylow Pipe Co.
Hedges-Walsh-Weidner Co.
National Tube Co.
The Stacey Mfg. Co.
United States Pipe & Foundry Co.
The Western Gas Construction Co.
Bell
American Meter Co.
Semet-Solvay Engineering Corp.
McWane Cast Iron Pipe Co.
Bell and Spigot
U. S. Cast Iron Pipe & Foundry Co.
Cast Iron
Southwestern Pipe Joint & Eng Co.
McWane Cast Iron Pipe Co.
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Flange
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U. S. Cast Iron Pipe & Foundry Co.
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Spigot
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Steel
Bartlett-Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
Naylor Pipe Co.
National Tube Co.
Pittsburgh Steel Products Co.
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Naylor Pipe Co.
Welded Steel
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National Tube Co.
Riter-Conley Company.
Semet-Solvay Engineering Corp.
PIPE COATINGS
Quigley Furnace Specialties Co.
Wailes Dove-Hermiston Corp.
PLANTS—GAS, COMPLETE
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
The Koppers Construction Co.
Philfuels Co.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company
PLATES
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
The Stacey Mfg. Co.
The Western Gas Construction Company.
Floor
Gas Engineering Co.
The Gas Machinery Co.
Riter-Conley Company.
The Stacey Bros. Gas Construction Co.
United Engineers & Constructors, Inc.
PLUGS, SERVICE AND MAIN
Rubber
Safety Gas Main Stopper Co.
Soft Wood
Safety Gas Main Stopper Co.
PORTABLE TEST METERS
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
PRODUCER GAS PLANT
Gas Engineering Co.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
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The Western Gas Construction Company.
PRODUCER GAS STEAM
American Meter Co.
PROVERS—Critical Flow for H. P Field Testing
American Meter Co.
PROVERS—METER
American Meter Co.
Lambert Meter Co.
Pittsburgh Equitable Meter Co
Superior Meter Co.
PUMPS
Drip
American Meter Co.
The Gas Machinery Co.
Lambert Meter Co.
D. McDonald & Co.
Geo. D. Roper Corp.
Gas
Connersville Blower Co.,
The P. H. & F. M. Roots Company.
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Safety Gas Main Stopper Co.
Hand
American Meter Co.
Lambert Meter Co.
Safety Gas Main Stopper Co.
Oil
Connersville Blower Co., The
The Gas Machinery Co.
The P. H. & F. M. Roots Company.
Power
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Geo. D. Roper Corp.
Pressure
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Service
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
Service Cleaner
American Meter Co.
Lambert Meter Co.
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Superior Meter Co.
Tar
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Water
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Vacuum
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The P. H. & F. M. Roots Company.
PURIFIERS
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Company.
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Riter-Conley Company.
United Engineers & Constructors Inc.
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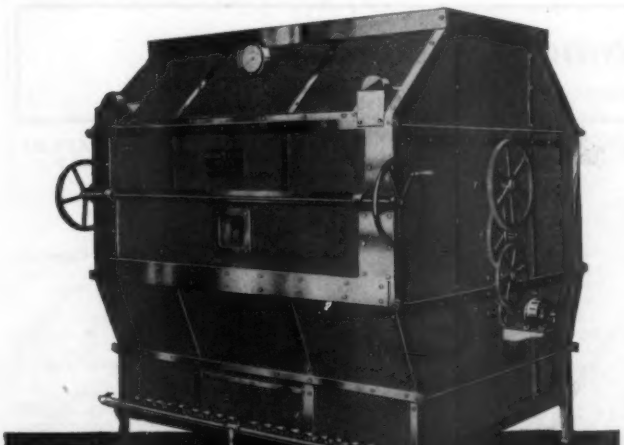
PURIFYING MATERIALS
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Gas Purifying Materials Co., Inc
The Koppers Construction Co.
E. J. Lavino & Co.
PURIFIER TRAYS
Bartlett-Hayward Co.
Connelly Iron Sponge & Governor Co.
Cruse-Kemper Co.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors



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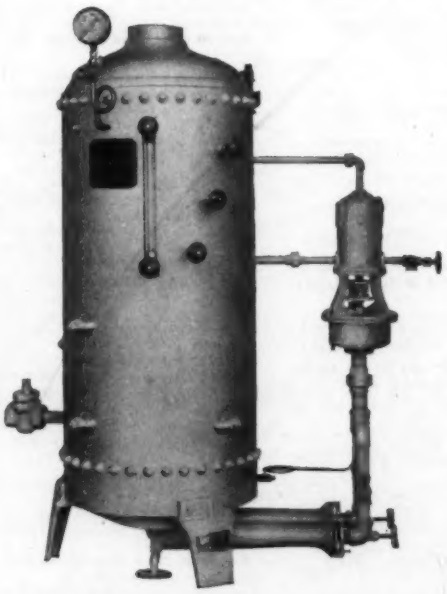

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Manufactured in various gas capacities, and forms adapted to specific needs, these burner tips are employed by many industries where gas is used, and production depends upon a steady, dependable flame.
Made in 15, 30 and 45 cubic foot capacities to fit standard reducing couplings.

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Inc.
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PYROMETERS
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Taylor Instrument Companies.
United Engineers & Constructors, Inc.
Radiation
Taylor Instrument Companies.
Recording
The Brown Instrument Co.
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Taylor Instrument Companies.
United Engineers & Constructors, Inc.

RADIATORS
Gas Steam
American Gas Products Corp.

RADIATORS—VERTICAL FIN
Wolverine Tube Co.

RANGES—GAS
American Stove Co.
Geo. D. Roper Corpn.
Standard Gas Equipment Corp.

RANGES (HOTEL AND RESTAURANT)
Geo. D. Roper Corpn.
Standard Gas Equipment Corp.

RECORDERS—LIQUID LEVEL
The Bristol Co.
The Brown Instrument Co.

RECORDING DEMAND METERS
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Lambert Meter Co.

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United States Refractories Corp.

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Quigley Furnace Spec. Co. Inc.

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Botfield Refractories Company
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General Refractories Co.
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Air Pressure
Brown Instrument Co.
Time-O-Stat Controls Co.
Smoot Engineering Corp.
Coke Oven Suction Main
Smoot Engineering Corp.
Exhauster
Brown Instrument Co.
Connersville Blower Co.
Smoot Engineering Corp.
Furnace Pressure
Smoot Engineering Corp.
Oven
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Pressure
Connersville Blower Co.
Steam Pressure
Smoot Engineering Corp.
The Brown Instrument Co.
Suction
Connersville Blower Co.

REPAIR PARTS
American Meter Co.
Lambert Meter Co.

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Connelly Iron Sponge & Governor Co.
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The Gas Machinery Company
United States Refractories Corp.

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SAFES
Remington Rand Inc.

SAFETY VALVES
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SCREENS, ELECTRIC VIBRATING
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Spencer Thermostat Co.

SERVICE BOXES
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SERVICE PLUG-RUBBER
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SKIP HOIST
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SPECIFIC GRAVITY GAUGES
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Safety Gas Main Stopper Co.

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Andale Company.

STREET DEPT. EQUIPMENT
American Meter Co.
Connelly Iron Sponge & Governor Co.
Safety Gas Main Stopper Co.

STREET LAMPS
Welsbach Street Lighting Co.

SULPHUR AND AMMONIA TEST (Apparatus)
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Hot Water Heat Control
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Precision Thermometer & Instrument Company

TAMPERS AND BACKFILLERS
The Cleveland Trencher Co.

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Reynolds Gas Regulator Co.

TANKS
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The stacey Bros. Gas Construction Co.
The Western Gas Construction Company.
Gas, Oil, Storage
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
High Pressure
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Riter-Conley Company.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.

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TAR DISTILLING PLANTS
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Semet-Solvay Engineering Corp.
West Gas Improvement Co.

TAR DISPLACEMENT SYSTEM
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TAR EXTRACTORS
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Isbell-Porter Co.
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United Engineers & Constructors, Inc.

TEMPERATURE CONTROLING DEVICE—Oven
American Stove Co.
The Bristol Company.
Brown Instrument Co., The
Robertshaw Thermostat Co.
Taylor Instrument Companies.

TESTING APPARATUS, GAS
American Meter Co.
Pittsburgh Equitable Meter Co.
Precision Thermometer & Instrument Company

THERMOCOUPLER
The Brown Instrument Co.

THERMOMETERS
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Lambert Meter Co.

THERMOCOUPLE TUBES
The Brown Instrument Co.
Precision Thermometer & Instrument Company.
Superior Meter Co.
Taylor Instrument Companies.

THERMOSTATS
The Bristol Company
Brown Instrument Co., The
Precision Thermometer & Instrument Company
Robertshaw Thermostat Co.
Spencer Thermostat Co.
Taylor Instrument Companies.

THERMOSTATIC METAL
W. H. Chace Valve Co.

TOASTERS
American Gas Products Corp.

TOOLS
Semet-Solvay Engineering Corp.

TORCHES—WELDING AND CUTTING
Oxweld Acetylene Co.
Union Carbide & Carbon Co.

TRENCH DIGGERS
The Cleveland Trencher Co.

TUBES, BOILER
National Tube Co.
Pittsburgh Steel Products Co.

TUBES
Seamless Steel
National Tube Co.
Pittsburgh Steel Products Co.

TUBING — (Seamless) ALUMINUM, COPPER, BRASS
Wolverine Tube Co.

TYPEWRITERS
Remington Rand, Inc.

U GAUGES
American Meter Co.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Lambert Meter Co.
Pittsburgh Equitable Meter Co.
Precision Thermometer & Instrument Company.
Safety Gas Main Stopper Co.
Superior Meter Co.
Taylor Instrument Companies.

Underground Construction Accessories
The Cleveland Trencher Co.

UNIT HEATERS
Wolverine Tube Co.

VACUUM GAUGES
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Lambert Meter Co.
Pittsburgh Equitable Meter Co.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.

VALVES
Bartlett-Hayward Co.
Chaplin-Fulton Mfg. Co.
Darling Valve and Manufacturing Co.
The Gas Machinery Co.
Groble Gas Regulator Co.
C. W. Hunt Co., Inc.
The Ludlow Valve Mfg. Co.
Pittsburgh Equitable Meter Co.
Semet-Solvay Engineering Corp.
High Pressure Special
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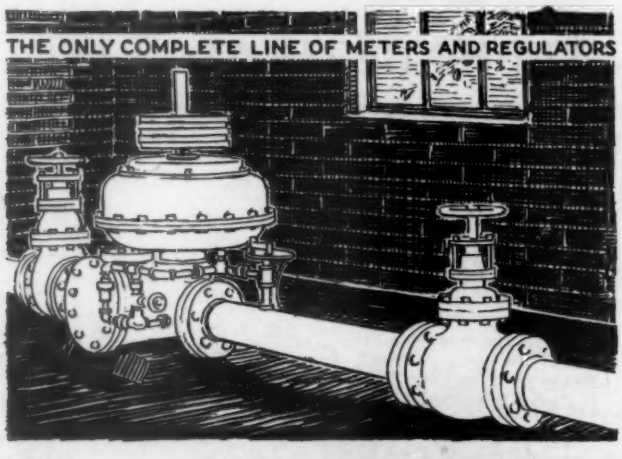

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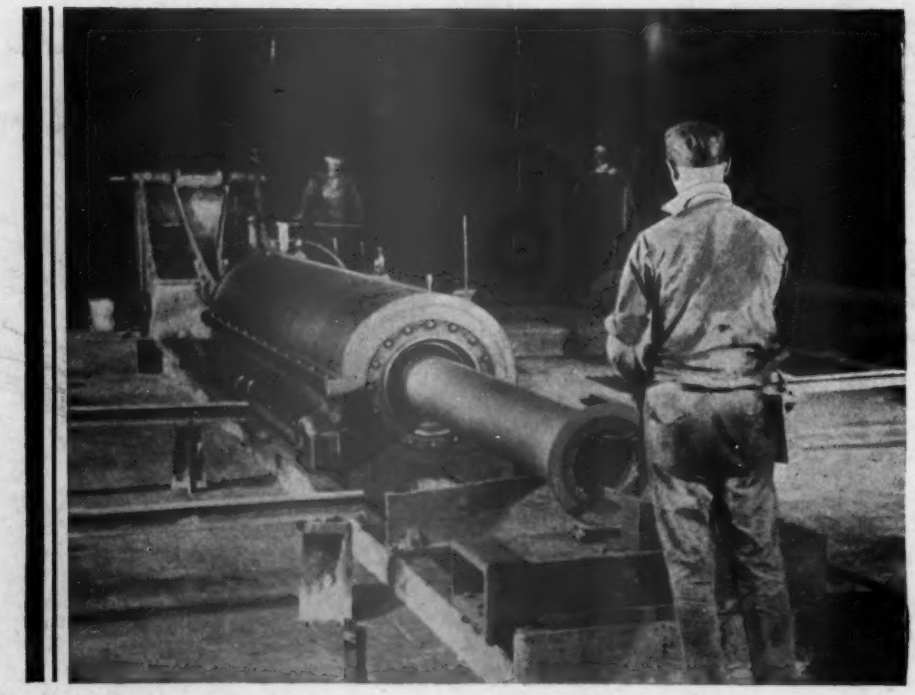

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